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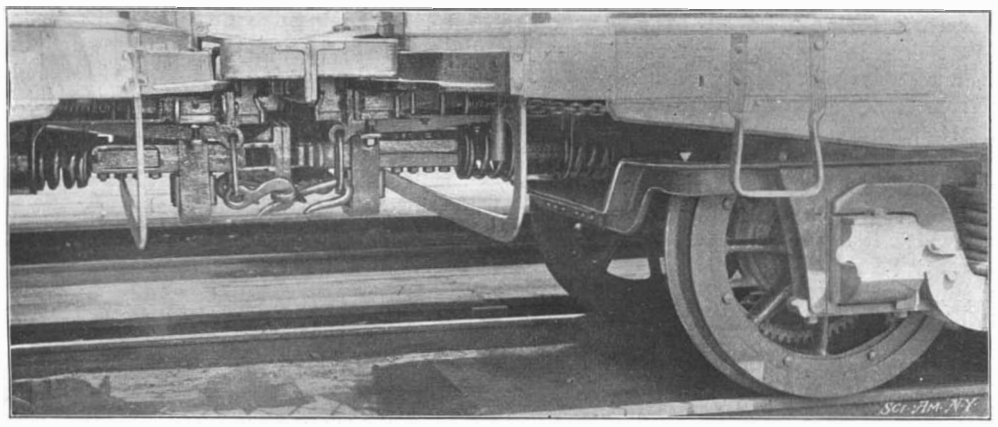
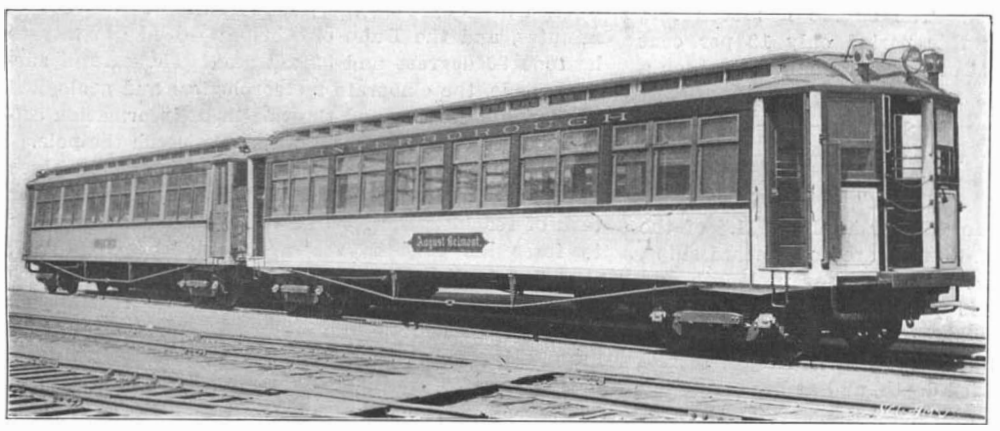
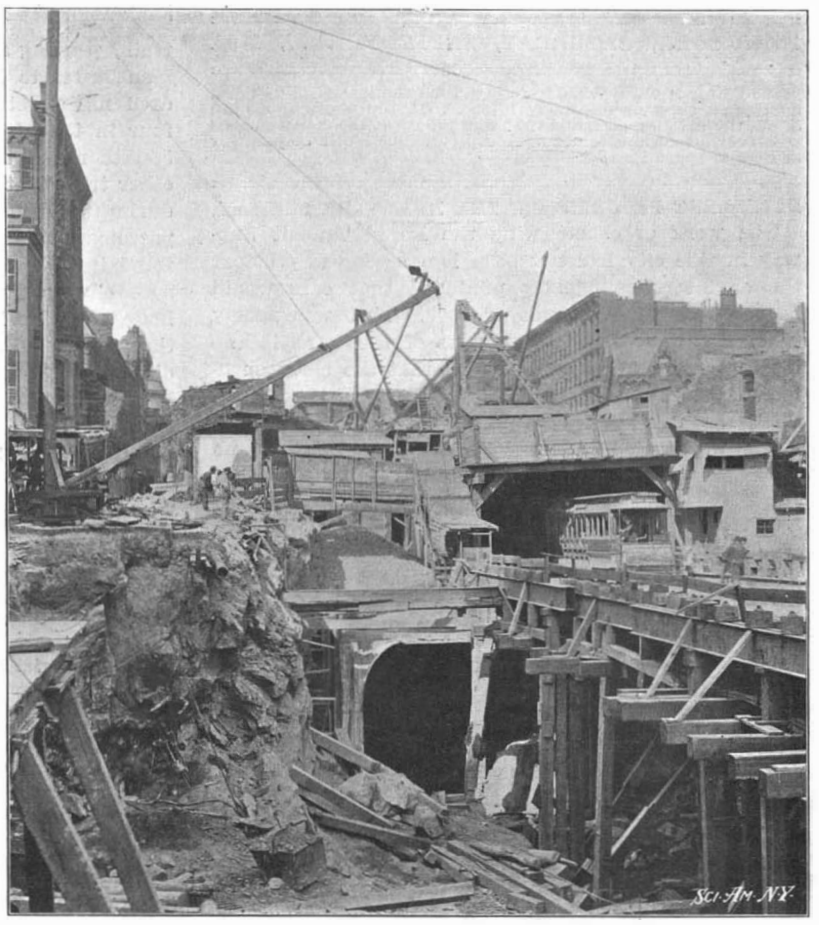


Platforms and Couplings of Cars.



Cars Submitted for Trial on the Rapid Transit Subway.



Station Excavation and Portal of Tunnel at 33d Street.

Typical Cross-Section of Subway on Fourth Avenue, Showing Method of Supporting Trolley Tracks and Gas and Water Mains During Construction.

THE RAPID TRANSIT SUBWAY, NEW YORK.—[See page 202.]

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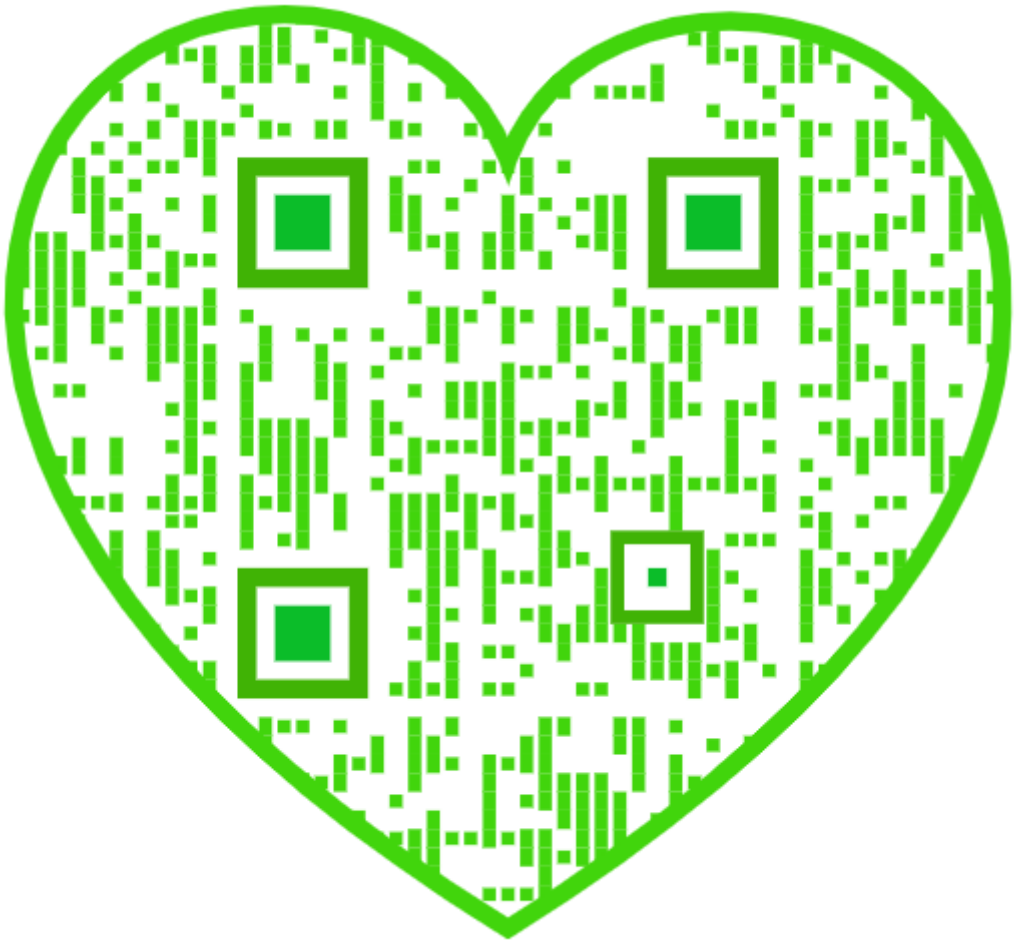

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NEW YORK, SATURDAY, SEPTEMBER 27, 1902.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

EXCELLENT PROGRESS ON THE NEW YORK SUBWAY.

The work of constructing the Rapid Transit Subway in this city had not been long under way before the engineers confidently predicted that cars would be running by Christmas of 1903. That was nearly two years ago; and the progress of the work in the interval has been so satisfactory that the early opening of the road is to-day more certain than ever. With the exception of the huge irrigation dam in Egypt, illustrated in our last issue, we know of no other great engineering work of modern times that will have been completed many months before the contract date. It is unfortunate for New York city that similar dispatch has not been shown on some other municipal improvements, notably the Croton Dam, the Jerome Park Reservoir, the new East River Bridge and its successor, Bridge No. 3, all of which have been allowed to drag wearily along, the speed of construction being apparently left entirely to the inclination of the contractors. According to figures furnished to the SCIENTIFIC AMERICAN by the Chief Assistant Engineer of the Rapid Transit Commission, Mr. George S. Rice, out of a total estimated cost of $35,000,000, $21,000,000 has been paid out to date, and judged on this basis the road may be said to be sixty per cent completed. Out of a total earth excavation of 1,700,000 cubic yards, 1,580,000 cubic yards, or 93 per cent, has been taken out. Of a total rock excavation of 1,300,000 cubic yards, 862,000 yards has been excavated, leaving 34 per cent yet to be done. A most important item as affecting the completion of the work is the delivery of steel, of which 65,000 tons are required. Up to date some 40,000 tons, or 62 per cent, has been delivered. In estimating the time necessary for completion it should be borne in mind that the remaining work will be put through with greater celerity than that which has been already done, for the reasons that the plant is on the ground, valuable experience as to best methods of doing the work has been gained, and everything is in smooth working order.

LONG LIFE VS. THE SCRAP HEAP.

In discussing the differences between the methods of management adopted here and in England, one of the leading railroad officials of this country recently remarked that in England they do not know the value of the scrap heap. In the main the criticism was correct; for undoubtedly in their desire to get the greatest possible amount of work out of a machine before condemning it, the English have carried the principle too far, and are to-day using cars and locomotives which cannot, from any point of view, be said to be doing economical work. In this country, we build with the expectation that the rapid development in the size of individual units, and the changes due to a policy which aims at the quick adoption of every well-proved method or device, will make it necessary to condemn machinery and plant long before it is worn out, and introduce more up-to-date machinery, which will quickly save in time and labor a greater sum than its own first cost. Perhaps also the smallness of the scrap pile in Great Britain may be accounted for in some measure by the difference in local traffic conditions, particularly as regards railway passenger service, where the policy is to run many express trains of moderate weight, as against the heavier and less frequent express trains in this country. Hence many locomotives, that were built twenty or more years ago, are still sufficiently powerful to haul the British express trains of to-day, and this in spite of the fact that of late years there has been a considerable acceleration of the speed.

The long life of the English locomotive is a direct testimony, of course, to the excellence of its design and construction, and to this is to be attributed, in part, its higher cost as compared with the cost of an American locomotive of the same class. At any rate, it is certain that there have been some remarkable instances of continuous and extremely hard service performed by individual locomotives for a long stretch of years. The Locomotive Superintendent of the London & Northwestern Railway Company has recently issued some most interesting data regarding the performance of an express engine, the "Charles Dickens," which is well known in England and will be familiar to many Americans who have traveled between Manchester and London. This engine was built in 1882, just twenty years ago, at the company's works at Crewe, and in the two decades of its service it has run exactly two million miles. As the average performance of an English locomotive is a little over twenty thousand miles a year, it will be seen that, on the basis of ordinary duty, this remarkable engine has practically performed a hundred years of service. The engine has been accustomed to take an early train, starting at half past eight in the morning, from Manchester to London, a distance of about two hundred miles, returning from London the same day at four in the afternoon. It has recently completed its 5,312th round trip in addition to nearly two hundred other trips that it has made; and it is significant that during the whole of its long journeyings not a single passenger on the trains which it has hauled has suffered injury. In the twenty years of its service, the speed has gradually risen from 42 to 50½ miles an hour, and this in spite of the fact that the weight of the trains has been increased by an addition of heavy dining and corridor cars and other weight-involving luxuries of modern travel. During its twenty years of service the engine has burned 27,486 tons of coal and has evaporated 204,771 tons of water, the consumption of coal averaging 32 pounds to the mile—a remarkably economical performance. The engine has been laid up for repairs during this period only 12 per cent of the time, and the cost of its maintenance has been a fraction over 3 cents a mile.

THE LATEST ATLANTIC STEAMSHIP.

The two giant steamships which have been recently launched in Europe, the "Cedric" of the White Star Line at Belfast, and the "Kaiser Wilhelm II." of the North German Lloyd at Stettin, are both record ships, the one in displacement and the other in length and speed. The "Cedric" is practically a sister-ship to the "Celtic," but exceeds that vessel in displacement by about 1,000 tons. She is 700 feet in length, 75 feet in beam, 49 feet in molded depth, and at her maximum draft of 36½ feet (to which, by the way, she cannot be loaded until the new 40-foot channels are dredged) she will displace about 38,500 tons. The fact that the White Star Line should order another vessel of the huge proportions of the "Celtic" proves that, so far as their operation is concerned, there is a constant gain in economy as the proportions of these huge ships are increased. We have met both shipbuilders and shipowners who have asserted that a 1,000-foot vessel would be the best kind of a paying investment, and that there would be such ships afloat to-day were it not for the limitations imposed by the depth of harbors and the length of steamer piers.

The "Kaiser Wilhelm II." is, of course, in a different class from the "Cedric," and, like her, she will be the finest ship of her class. She belongs to the type of high-speed, luxuriously-appointed express steamers, which may be said to have had their commencement with the appearance of the "Lucania" and the "Campania" on the Atlantic. Like all the latest record-breakers in this service, she is a German-built and German-owned vessel. In her lines, general appearance, construction, and arrangements for the comfort of passengers, she will be a greatly enlarged edition of the "Kronprinz;" but in the arrangement of her engine room she will present considerable novelty, at least in a vessel of this type. Her length having been determined at 706½ feet, the "Kaiser Wilhelm II." may claim to be the longest ship afloat, the "Oceanic" being 2½ feet less. Her beam, 72 feet, is 3 feet less than that of the "Celtic" and "Cedric," and 4 feet greater than that of the "Oceanic." Her molded depth is greater than that of any other ship afloat, being 52½ feet as against 49 feet for the "Oceanic," "Celtic" and "Cedric." The molded depth of the "Kronprinz Wilhelm" is 43 feet, so that the shell plating of the new vessel is carried up 9½ feet, or the depth of one deck, higher than in the earlier German vessels. As a matter of fact, the "Kaiser Wilhelm II." will have a complete set of staterooms on what is ordinarily the boat deck, that is to say, one deck more than is usual on a vessel of this class will be devoted to passenger accommodation. The displacement of the vessel will be 26,000 tons on a draft of 29 feet, to which draft the vessels of this line are limited by the channel depths at the German ports. This is about 2,500 tons greater than the displacement of the "Deutschland" on the same draft, and 2,500 tons less than that of the "Oceanic" when she is drawing 32 feet 6 inches of water, and it will be 10,000 to 12,000 tons less than the maximum displacement of the "Celtic" and "Cedric."

An entirely new feature, at least in a transatlantic vessel, is the arrangement of the engine room. It was realized that in the engines of the "Deutschland," which have indicated 37,000 horse power, the limit of size for single engines had been reached; consequently, in providing the 38,000 to 40,000 horse power for the "Kaiser Wilhelm," it was determined to use four sets of four-cylinder, quadruple-expansion engines, placed in tandem, two sets on each shaft, each set being placed in its own separate water-tight compartment. The arrangement is new in passenger vessels, but has long been in use in the navy, our own "Brooklyn" being provided with four sets of engines. The contract speed of the vessel is 23 knots, and judging from the excess over contract speed obtained by other vessels built at the Stettin yard, it is probable that the "Kaiser Wilhelm II." will cross the Atlantic at an average speed of 24 knots an hour. The accommodations on this ship will be greater than on any previous vessel. She will carry 775 first-class, 343 second-class and 770 third-class passengers, making a total of 1,888 passengers. If to this be added a crew of 48 engineers and greasers, 229 stokers, 170 stewards, 61 cooks, 45 sailors, we get a total of 2,441 souls as the complement of the ship when her passenger list is completely filled.

THE RETURN OF LIEUT. PEARY.

Although Lieut. Peary returns to us once more without having reached the pole, his expedition has not been inglorious. He has at least succeeded in outstripping all previous American Arctic explorers, by penetrating to latitude 84 degrees 17 minutes. It cannot be denied that this is by no means the most northerly point ever reached; for the intrepid Nansen worked his way over the ice to latitude 86 degrees 14 minutes, and the Duke of Abruzzi forced his way to latitude 86 degrees and 33 minutes. The careful surveys made, the elaborate meteorological and geological studies undertaken, and the wealth of information collected fully compensate the failure to reach the pole.

Somewhat more than four years have elapsed since Peary ventured once more to undertake the baffling task of reaching the North Pole. It was his intention to force his way up the west coast of Greenland, through Smith Sound and Robeson Channel, and to establish a base of supplies at Sherard Osborn Fjord. He never carried out this intention. The ice closed in around the "Windward," so that he could not sail more than fifty miles above Cape Sabine. There Peary was held by the ice, an unwilling captive, for a year. Although icebound, he was not idle. Sled-parties were sent out in all directions, and much geographical information gathered. Of these sled-expeditions the most important was undertaken to Lady Franklin Bay, lying on the western side of Robeson Channel. The bay had been explored more than once, but no white man had visited it since the Greely expedition of 1883. It was during this Lady Franklin Bay trip that Peary sustained a severe injury. During a bitter storm, one of his feet was so badly frost-bitten that it was found necessary, on his return to the ship, to amputate a few of his toes.

News from friends at home was brought to the party by the "Diana," sent to the north in 1899 by the Peary Club. A few months later she returned, preceded by the "Windward." After establishing bases of supplies at advantageous points, Peary proceeded to Fort Conger, where he quartered himself in March.

Accompanied by his servant Hensen and five Esquimos, Peary left Conger on April 15, 1900, for Greenland. Doubling the north coast, he reached the most northerly point of Greenland, latitude 83 degrees 39 minutes, which is likewise the northernmost land ever trodden by man. Pushing on eleven minutes further, an impassable sheet of water was encountered. Compelled to abandon the idea of dashing for the Pole, Peary swept the eastern coast within a degree of Independence Bay. On July 10 Fort Conger was regained.

In 1900 the "Windward" was once more sent to the north. At Payer Harbor, near Cape Sabine, the "Windward" stayed from August 15 to July 3, 1901.

In the following spring Peary quartered himself at Conger. On April 1 he started northward over the Polar Sea, with Hensen, four Esquimos and six sledges. After six marches open leads and floes in motion were encountered. Each day's march became more perilous. Finally, at 84 degrees 17 minutes north latitude, northwest of Hecla, the polar track became impracticable, and further efforts to advance were given up. After an arduous journey Cape Sabine was reached on May 15. An excursion was made a few days later to Cape Louis Napoleon in order to complete the survey of Babbit's Bay. Several weeks later the "Erik" arrived with provisions. Then both the "Windward" and the "Erik" started for home.

The expedition has been the means of clearing up much that was but ill-understood. Highly-prized relics of former expeditions, as well as rare animals, geographical, mineralogical, and meteorological data were secured. With the news of the Baldwin fiasco not quite cold, Peary's return after a successful Arctic trip is particularly gratifying to Americans.

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THE HEAVENS IN OCTOBER, 1902.

BY HENRY NORRIS RUSSELL, PH.D.

The most important event of the month for the American amateur astronomer is the total eclipse of the moon which takes place on the night of the 16th and 17th. Though lunar eclipses are not of rare occurrence, it is almost three years since we have seen one of any size, and four years since we have been able to observe one that was total. Since this is so, we may well spend some time in discussing the causes and phenomena of such an event, even though they may be familiar to many of our readers.

Everyone knows that eclipses of the moon are caused by her passage through the earth's shadow. This shadow extends from the earth in exactly the opposite direction to the sun, and, since the sun is larger than the earth, it tapers off to a point which is about four times as far away as the moon's orbit. For an observer situated anywhere within it, the earth hides the sun completely.

If the moon's orbit were in the plane of the ecliptic we would have an eclipse at every full moon. But as it is actually considerably inclined, the moon usually passes north or south of the shadow, and so escapes eclipse.

At the present full moon the moon's path leads almost centrally through the shadow, and she is completely immersed in it for an hour and a half. The circumstances of the eclipse are as follows, the dates being given in Eastern standard time:

Moon enters penumbra October 16, 10:17 P. M.
Moon enters shadow October 16, 11:17 P. M.
Total eclipse begins October 17, 12:19 A. M.
Total eclipse ends October 17, 1:48 A. M.
Moon leaves shadow October 17, 2:50 A. M.
Moon leaves penumbra October 17, 3:50 A. M.

It is well visible throughout the United States, though on the Atlantic coast the eclipse will not be over until quite late.

There is little to be seen till some time after the moon enters the penumbra, but before she reaches the shadow proper the darkening on her eastern limb begins to show. The shadow itself looks almost black at first; but after a little the edge of the eclipsed part of the moon begins to show. Its color is grayish near the edge of the shadow, but farther in it is deep coppery red.

This illumination is due to sunlight refracted into the shadow by the earth's atmosphere, which acts like a lens. Since this light has traversed many miles of air it is colored in the same way as that of the setting sun. Most of the light near the edge of the shadow has passed through but little air and is therefore not much colored; but near the center we get the full benefit of the sunset tints.

The brightness of the eclipsed moon varies greatly in different years, depending on the weather in the region where the light passes through our atmosphere. When this is cloudy much of the light may be cut off, as in 1884, when the moon was quite invisible to the naked eye.

Though the edge of the shadow seems sharp to the naked eye, it appears very hazy in the telescope. This effect is also due to our atmosphere, and deprives lunar eclipses of much of their astronomical value, as, if the phases could be sharply observed, they could be used to determine longitude.

On October 30 there is a partial eclipse of the sun, invisible in this country, but visible in eastern Europe and throughout most of Asia.

THE HEAVENS.

At 9 P. M. on October 15 Cygnus is some distance west of the zenith. Lyra and Hercules are below it on the west, and Aquila on the southwest. Aquarius and Capricornus are nearly due south. Below the former is Fomalhaut, the only conspicuous star in the southern sky, and above it is Pegasus. Andromeda, Perseus and Auriga extend northwestward from the last-named constellation. South of them lie Aries and Taurus, the last just rising. Pisces and Cetus fill the southeastern sky. Cassiopeia is above the Pole on the right, and Ursa Major below on the left.

THE PLANETS.

Mercury is evening star until the 19th, when he passes inferior conjunction and becomes a morning star. Being south of the sun he can hardly be seen, except at the very last of the month.

Venus is morning star. She is steadily approaching conjunction, rising over an hour before the sun on the 1st, and only half an hour before him on the 31st.

Mars is morning star in Leo, rising about 2 A. M. On the 19th he passes close to the bright star Regulus, being about 1 deg. north of it.

Jupiter is evening star in Capricornus, and is on the meridian soon after dark. He is bright enough to cast shadows which can be seen faintly out of doors and easily in a darkened room when the planet shines in the window.

Saturn is evening star in Sagittarius. On the 15th he is in quadrature with the sun and is due south at 6 P. M.

Uranus is in Ophiuchus, and is low in the southwest after sunset.

Neptune is in Gemini, and comes to the meridian at about 4 A. M.

THE MOON.

New moon occurs at noon on the 1st, first quarter at noon on the 9th, full moon at 1 A. M. on the 17th, last quarter at 6 P. M. on the 23d, and new moon again at 3 A. M. on the 31st. The moon is nearest us on the 19th and farthest away on the 7th. She is in conjunction with Mercury on the 3d, Uranus on the 7th, Saturn on the 10th, Jupiter on the 11th, Mars on the 26th, Mercury again on the 29th, and Venus on the 30th.

THE FIRST MAP BEARING THE NAME OF AMERICA.

BY A. GEHLEN.

We all have learned as boys at school that Columbus, the discoverer of America, was deprived of the honor of having the newly-discovered continent called after his name by the German geographer Martin Waldseemüller. It was in his book "Cosmographiae Introductio," published at St. Dié in the year 1507, that this scientist first proposed the name "America" for the new land in honor of Amerigo Vespucci, of Florence. The famous passage reads as follows: "Quarta pars (i. e., of the earth) per Amerigum Vesputium . . . inventa est, quam non video cur quis inre vetet ab Americo inventore. . . . Amerijen quasi Americi terram sive Americam dicendam, cum et Europa et Asia a mulieribus sua sortita sint nomina." ("The fourth continent was discovered by Amerigo Vespucci; and I do not see why one should have any just reason against it, that this country should be called after its discoverer the land of Amerigo or America; for Europe as well as Asia have received their names from women.")

But where was this name of the new world first practically used? What map first bore the name of America?

A. von Humboldt in his "Critical Researches" (Berlin, 1852) still maintained that the map of Apian of the year 1520 had this honor. Scientists, however, soon agreed that there must have been even earlier maps that contained the name "America," and Prof. Elter (De Henrico Glareano, Bonn, 1896) demonstrated that a map of the geographer of St. Dié must have existed as far back as the year 1507, and that this was the first map that contained the name of America, the later maps (also that of Apian) being to a great extent copies of it. Elter even gave hints for its reconstruction.

But where was this map to be found? To discover it was regarded among specialists as the highest prize of untiring historico-geographical research.

Then quite unexpectedly in October, 1901, German and soon also American journals brought the news that the map of Waldseemüller, so long forgotten, had at last been found. The fortunate discoverer is the Rev. Joseph Fischer, S. J., Professor of History and Geography at the Stella Matutina College at Feldkirch (Vorarlberg). The recent book of this scientific geographer on "The Discoveries of the Northmen in America"* gives us further information on this interesting subject.

Engaged for more than seven years in scientific investigations on the discoveries of the Northmen in America, Fischer searched either personally or through his friends in different libraries and archives of Germany, Austria, Italy, France and Belgium for documents bearing on the subject of his investigations. How much new material and how many documents he has found, how many questions in the interesting controversy of the Norse discoveries he has solved or brought nearer to their solution, is evinced in every part of his book.

The most remarkable discovery, however, was that of two large maps of Waldseemüller of the years 1507 and 1516 respectively. Fischer himself thus narrates his discovery:

On the third day of my systematic searching in the library of Prince Waldburg in the Castle Wolfegg, I discovered a codex in large folio with the inscription 1515, containing besides others two large maps of the world. Each of the maps covers twelve pages, about 580 millimeters in length and 420 millimeters in breadth. The first four pages form the upper part, the following four the middle, the last four the lower part of the map. The two maps together, therefore, comprise 24 pages. This valuable codex was formerly in the possession of John Schöner, the famous mathematician and cartographer. On page 9 Fischer found printed in large letters the name "America." Then followed on the next three pages the title in large capital letters: "Universalis Cosmographia secundum Ptholomaei traditionem et Americi Vespucii aliorumque lustrationes." ("Universal Cosmography, According to the Traditions of Ptolemy and the Voyages of Amerigo Vespucci and Others.")

The second map bore on the upper margin likewise in big capitals the title in Latin: "Marine sailing chart, giving the general outlines of the voyages of the Portuguese, as well as the shape and nature, the situation and the boundaries of every known sea and land, as explored in our own times, and differing from the traditions of the ancients, and not mentioned by any of the olden writers." As to the time of the production of the second map, page 20 mentions expressly that it was printed "on the vigil of Pentecost, 1516." On the following page a long inscription was found beginning with the words: "Martinus Waldseemüller (!) Ilacomilus lectori felicitatem optat incolumem." ("Martin Waldseemüller wishes the reader unimpaired happiness.") The Carta marina, therefore, was a map of Waldseemüller. And this was affirmed on page 24, which at the same time contained the place where the map was printed.

It was not so easy to determine the first map which bore the title "Universalis Cosmographia." But that also this was a work of Waldseemüller, and that it was completed several years before the Carta marina, was evinced by the legends of both maps; that it is of the year 1507, and that it also was printed at St. Dié, was established by Fischer together with his former teacher, Prof. Wieser, of the University of Innsbruck, an authority of the first rank in the science of cartography. Details about it will be given in the preface to the publication in which Fischer and Wieser are about to communicate to the world in fac-simile reproduction the two famous maps so long lost.

Suffice it to say for the present that the famous "Cosmographiae introductio," the writing accompanying the map, already proves its genuineness; all the statements of the "introductio" are verified on the map: the papal keys, the imperial eagle, the crescent, the crosses signifying dangerous places, the name America, etc.; the Cosmographiae introductio is nothing else than an explanation of this map.

It is interesting to remark that on Waldseemüller's map of the world (Cosmographia universalis) North and South America are separated by an arm of the ocean; that in his Marine Chart (Carta marina) the continent opposite the island Isabella (Cuba) is called Terra de Cuba, Asie partis, that therefore Waldseemüller was still of the same opinion as Columbus, that the newly discovered countries formed the eastern coast of Asia.

Still more interesting is the fact that the German geographer in his second map tried to right the wrong he had done to Columbus. The name of America is here replaced by "Brasilla sive terra papagalli" (parrot's land), and in a legend added to the map Vespucci is named in the third place, while Christopher Columbus is mentioned first: "Hec per Hispanos et Portogalenses frequentatis navigationibus inventa circa annos Domini 1492, quorum capitanei fuere Cristoferus Columbus Ianuensis primus. Petrus Aliares [Cabral] secundus. Albericusque Vesputius tertius." ("These countries were discovered in several voyages about the year of the Lord, 1492, the captains being, first, the Genoese Christopher Columbus, next Peter Aliares (Cabral), and thirdly Albericus Vespucci.")

But it was too late! The map of 1507 (one thousand copies of which had been printed) and the accompanying Cosmographiae introductio had already spread the name "America" far and wide.

*Joseph Fischer, S. J. Die Entdeckungen der Normannen in America. Unter besonderer Berücksichtigung der Kartographischen Darstellungen. Mit einem Titelbild, zehn Kartenbeilagen und mehreren Skizzen. Freiburg. Herder. 1902.

A New Comet Discovered.

A comet was discovered by Grigg at New Zealand on July 22. The predicted place for September 17 was in right ascension 15 hours, 37 minutes and 16 seconds, and in declination 7 deg. 58 min.; daily motion in right ascension + 2 minutes 32 seconds; daily motion in declination — 0 deg. 7 min. The brightness has rapidly decreased. This predicted position is but a rough approximation.

The Laying of a British Pacific Cable.

The steamship "Colonia," the largest of all cable vessels, reached Esquimault on September 13, having on board 3,450 miles of cable. The cable steamship "Anglia" is to meet the "Colonia" at Honolulu. The "Colonia" will lay her cable from Bamfield Creek to within 100 miles of Fanning Island, where the end will be buoyed and moored. The connecting link will be laid by the "Anglia."

Another Transatlantic Record.

The "Kronprinz Wilhelm," of the North German Lloyd Company, has broken the western transatlantic record, held for two years by the "Deutschland," by about 26 minutes. The "Deutschland's" record was 5 days, 12 hours and 29 minutes from Cherbourg; the "Kronprinz Wilhelm's" new record is 5 days, 11 hours and 57 minutes. The daily runs of the "Kronprinz Wilhelm" were 349, 574, 574, 581, 573 and 396 miles.

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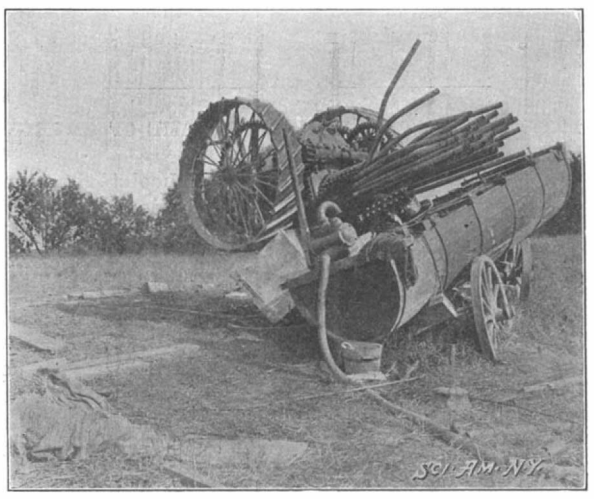
PORTABLE ENGINE BOILER EXPLOSION.

We present some views of a rather curious boiler explosion which occurred last month at Wauseon, Ohio. The accident happened to a 15-horse power, compound, threshing engine, which had been in use for about five years. The explosion occurred in the barrel of the boiler at one of the longitudinal seams which, on examination, proved to have been so much corroded that there was not more than 1-16 of an inch of the original shell left. The shell opened at this point and flattened out. At the same time the firebox, with most of the tubes, was torn loose from the smokebox and front end of the boiler, and turned a complete somersault backward on its tender, falling upon a man who had been sitting upon the tank at the moment of the explosion and killing him instantly. A boy who was standing immediately back of the firedoor was grazed by the rear end of the boiler, but received no fatal injury. The smokestack and front end of the boiler were blown over the straw stack formed by the thresher, and landed some 90 feet away The flywheel was thrown 60 feet to the right, while the cylinders and engine bed were thrown about 200 feet to the rear. While those who were responsible for the running of the engine claim that there was sufficient water in the boiler, it is generally believed that low water and corrosion were the cause of the disaster.

MOST POWERFUL EXPRESS LOCOMOTIVE IN GREAT BRITAIN.

There has been a remarkable development among British locomotive builders in the size and power of the engines which they have been turning out of late years. It was not so very long ago that 1,200 to 1,300 square feet of heating surface was the maximum for an English passenger engine; and there are to-day thousands of locomotives doing first-class service on English roads that do not have more than 1,100 or 1,200 square feet of heating surface in their boilers. The road which has made the greatest advance in the power of its engines is the Great Western Railroad, of which Mr. Dean has been the locomotive superintendent. The latest engine of his design is the huge affair which we herewith illustrate. While the heating surface would be large, even on an American road, it is not comparable to the boiler capacity of such engines as the latest express locomotives of the New York Central Railroad, which have 3,500 square feet of heating surface; but for an English road the 2,410 square feet of Mr. Dean's engine is altogether unprecedented. The engine is of the ten-wheeled, six-coupled, outside-connected type. The driving wheels are 80½ inches in diameter, and the loads on the wheels are equalized. The cylinders are another abnormal feature in this engine. They have a stroke or no less than 30 inches for a diameter of 18 inches. Ordinary English or American practice would give for a diameter of 18 inches a stroke of 24 or 26 inches. Both steam ports and exhaust ports have a circumference of 20½ inches, the width of the steam ports being 1⅝ and of the exhaust ports 2 7-16 inches. The barrel of the boiler varies in outside diameter from 4 feet 10¾ inches to 5 feet, the length of the barrel being 14 feet 8 inches. The outer dimensions of the firebox are: Height, 6 feet 6⅝ inches and 5 feet and ⅝ inch; breadth, 5 feet 6⅛ inches, and length, 9 feet. There are 287 2-inch tubes with a length of 14 feet 11⅞ inches. The area of the grate is 27.62 square feet. The working pressure is 200 pounds to the square inch, and the tractive force 21,734 pounds. We understand that the next engines of this class that will be built will have less heating surface by about 300 square feet.



FIREBOX AND TUBES THROWN OVER AND BACK UPON TENDER.

PORTABLE ENGINE BOILER EXPLOSION.

Dewar on England's Educational Needs.

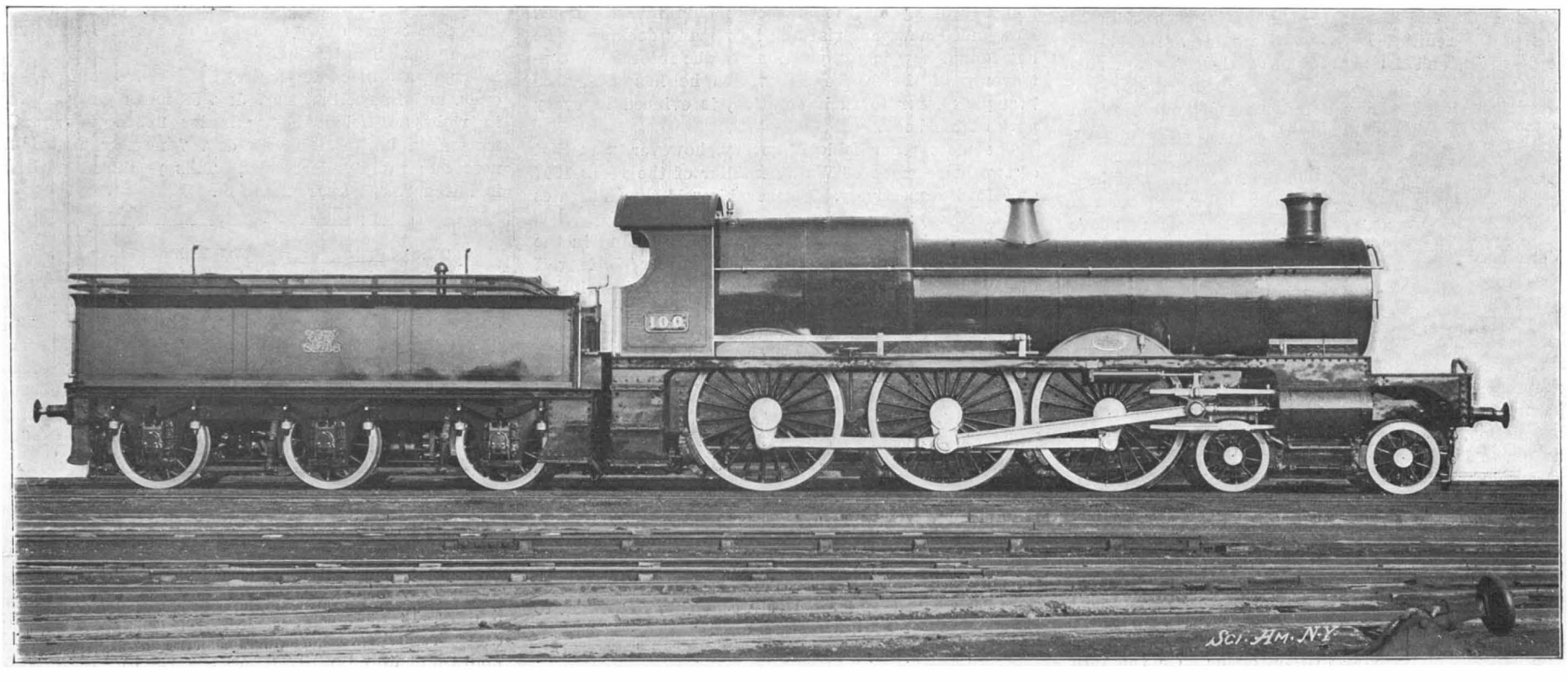
At the annual meeting of the British Association for the Advancement of Science, held in Belfast on September 10, Prof. Dewar made a stirring appeal for the improvement of the national system of scientific education. As an instance of the importance of science to a country he pointed out that the German chemical industries, which have grown up during the last seventy years, are worth £50,000,000 annually. Curiously enough, these chemical industries are founded on basic discoveries made by English scientists, discoveries never properly appreciated or scientifically developed in the land of their birth. Prof. Dewar believed that the crying need of the country was for education among the very classes which claim to be educated, and secondly among the laboring people. He eloquently remarked:

"It is in an abundance of men of ordinary plodding ability, thoroughly trained and methodically directed, that Germany at present has so commanding an advantage. It is the failure of our schools to turn out, and of the manufacturers to demand, men of this kind, which explains our loss of some valuable industries and our precarious hold on others. Let no one imagine for a moment that this deficiency can be remedied by any amount of that technical training which is now a fashionable nostrum. It is an excellent thing, but it must rest upon a foundation of general training. Mental habits are formed for good or evil long before men go to technical schools. We have to begin at the beginning.

"The really appalling thing is not that the Germans have seized this or that industry, or even that they may have seized a dozen industries. It is that the German population has reached a point in general training and specialized equipment which will take us two generations of hard and intelligently directed educational work to attain; it is that Germany possesses a national weapon of precision, which must give her an enormous advantage in every contest depending upon disciplined and methodized intellect."

The Industry of Algeria.

The wine industry at the present day constitutes the largest industry in Algeria. Until the last two years it had been going up by leaps and bounds, many large fortunes having been made. During 1900 and 1901, however, the price of wine steadily decreased on account of the abnormal yield in France, and great losses were consequently incurred by those who were forced to dispose of their vintage. The outlook of the wine grower in Algeria is much brighter this year, the crops in France having been greatly damaged by late frosts, wet, and severe hailstorms. The amount of wine exported from Algeria during 1897 was 781,558 gallons; in 1898, 796,049 gallons; in 1899, 945,879 gallons; and in 1900, 549,131 gallons. The other principal products are alfa, cereals, cork, vegetable hair, locust beans, olive oil, fruits, and vegetables, and Italian pastes. The area which alfa occupies in the three departments of Algeria is estimated at more than 12,000,000 acres. The principal district, called the "Alfa Sea," is 210 miles by 95 miles and is bounded on the north by the Tell, on the west by Morocco, on the south by the mountains of Ksowes, and on the east by the Hodna. The producing area is much greater than that actually cut; nevertheless, in order to prevent the loss which would result from bad working, the Governor-General issued an order in 1888 limiting the cutting, sale, and export of alfa. The average production of an acre of alfa is estimated at 8 cwt. after drying and sorting. In 1900 Algeria exported 1,650,235 cwt. of wheat, 1,188,153 cwt. of oats, 1,773,569 cwt. of barley, and 27,496 cwt. of maize. The barley is much in demand in Europe for malting purposes. Algeria produces excellent hard wheat, giving a flour rich in gluten, and consequently very good for the manufacture of Italian pastes and semolina. This industry is annually increasing; the existing works are enlarging and improving their machinery, modern methods of shop management are being introduced, and the output of the various establishments to-day rivals that of France and other countries.



Cylinders, 18 inches by 30 inches. Driving Wheels, diameter, 80½ inches. Heating Surface, 2410 square feet. Working Pressure, 200 pounds to the square inch.

MOST POWERFUL EXPRESS ENGINE IN GREAT BRITAIN.

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TEMPERATURE AND HUMIDITY REGULATORS.

The automatic regulation of the temperature of an apartment heated by water, steam, gas or air may render very great services not only in industrial, but in domestic heating, as, for example, in the keeping of the temperature of a parlor, hospital ward, etc., constant. Such a result is obtained by means of the apparatus represented diagrammatically in the accompanying figure, and constructed by M. Dorian. It consists of a metal receptacle, *A*, mounted on a suitable board and terminating at its lower end in a diaphragm chamber, *D*. A passage connects the bottom of this chamber with a rubber pipe, *B*, which is inclosed within a coiled spring. The spring in turn is inclosed in a stout supporting tube (shaded black in the figure), in the bottom of which fits a movable plunger that branches out and carries a large outer spring, *R*. This spring forces the rubber tube back to its original length, after the expansive fluid within it has ceased to act.

The receptacle, *A*, contains amylic alcohol, the rubber tube is filled with mercury, and the two fluids are separated from each other by the diaphragm, *D*. A valve-box, *P*, completes the system, and serves for the setting of the apparatus by regulating the pressure, which varies from 3 to 8 kilogrammes per square centimeter, according to the use for which it is designed.

The operation of the regulator is as follows: Under the influence of the variations in temperature acting upon the receptacle, *A*, the tube, *B*, elongates or contracts, and, if its free extremity is connected with the key of a stop cock, it will be able to open or close the passage through which flows the fluid designed for heating.

Although the spring, *R*, seems useless, it nevertheless plays a special rôle, which we shall explain by seeking to estimate the force that the apparatus is capable of exerting.

Let us take a regulator and dispense with the spring, *R*. During the expansion of the liquid in the receptacle, *A*, the rubber tube will elongate, and then, if it meets with a resistance (produced, for example, by the closing of a cock), it will be arrested. Now, as the receptacle continues to absorb heat units, the internal pressure will rise until its value is sufficient to overcome the obstacle. If the liquid contracts, the tube will shorten under the action of the atmospheric pressure.

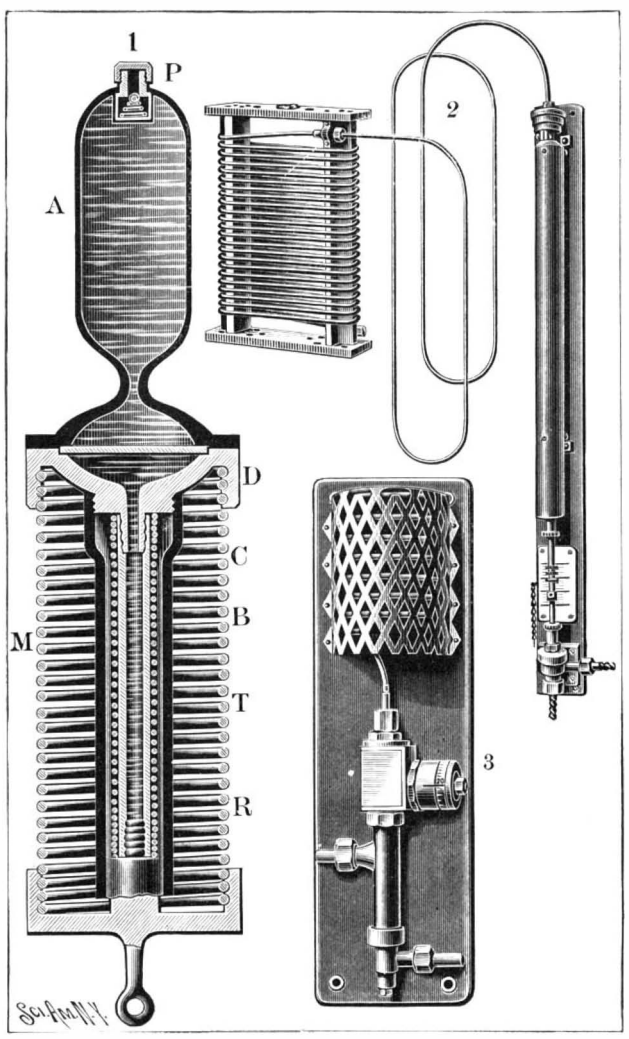
Thus, if the obstacle to be overcome requires a force of 5 kilogrammes and if the section of the rubber tube is one square centimeter, the internal pressure will rise to 6.033 kilogrammes (5 kilogrammes + the atmospheric pressure) in order to overcome the resistance. During the contraction, the force will be but 1.033 kilogrammes and consequently inadequate.

The object of the spring, *R*, therefore, is to increase the power of the apparatus at the moment of the contraction. During the expansion, the stress produced may be greater than the resistance to be overcome, and, in this case, the spring may store up the excess of energy in order to restore it in the inverse motion. During the expansion, the effective force produced is equal to the internal pressure less the contrary pressure of the spring, *R*, added to the atmospheric pressure.

During the contraction, the effective force is equal to the atmospheric pressure increased by the action exerted by the spring. This explanation shows that the power of the apparatus depends upon the section of the tube and the internal static pressure, and that the play of the tube depends upon the volume of the liquid and its coefficient of expansion. Upon causing all these factors to vary, it is possible to obtain the results desired.

In the apparatus as at present constructed the receptacle, *A*, has the form of a round or half-flat spiral (Nos. 2 and 3 of the figure), so that the surface influenced by heat may be increased. The sensitiveness of the apparatus is equal to that of a laboratory thermometer. The forms we illustrate, types *C* and *E*, are arranged for heating by illuminating gas.

Numerous applications have been made to domestic heating, in which case the regulator acts upon the gas, hot air, steam or water inlet, according to the system of heating employed. Among such installations may be mentioned the following: That made at the Consultation des Nourrissons du Gros-Caillou, Rue Saint-Dominique, in which all the halls of the clinic are heated by gas stoves. Two of the halls have been provided with temperature regulators. One of these is in the clinical room and the other in the pharmacy. In the first, the installation comprises one circular radiating hot-air stove and a Dorian regulator of the type *C*. The volume of air to be heated is about 90 cubic meters. In the second hall there is a stove of the same kind and a Dorian regulator of the *E* type. The volume of air to be heated is 60 cubic meters.



THE DORIAN HEAT AND HUMIDITY REGULATOR.

1. Section. 2. Type C of the regulator. 3. Type E.

The apparatus permits of fixing the regulation at any point whatever between 15 and 35 degs. C. (59 and 95 degs. F.). As the temperature required is 17 degs. the apparatus have been set at this point. The temperature obtained varies between 17 and 17.5 degs. and the output of gas has been diminished by about 50 per cent. Some other installations have been made. One, for example, in a saloon, comprises a semicircular stove of the Compagnie du Gaz with a regulator of the *E* type (No. 2 of the figure). The results obtained have been as satisfactory as the preceding.

Heating by gas offers very great advantages. It does away with the cost of the burning, storing and handling of coal, and consequently with dust. The lighting and extinction of the stove can be effected in an instant; and, since the flame is visible, it makes the room heated appear as cheerful as does a wood fire in a fireplace.

The odor that is often complained of when heating is done by gas is always due to defective installation, the means of egress from the room of the gas produced by combustion being inadequate.

The example of the heating of a clinical room is mentioned designedly in order to show that a perfect installation has no bad action upon the health, even upon that of delicate infants. Besides, the consumption of gas is considerably diminished by the use of the temperature regulator under consideration.

The same good results are obtained in industrial heating.

The mention of a single application will suffice to show the capabilities of this apparatus. In certain industries, such as the textile ones, it must be possible to regulate the degree of humidity of the air, in order to obtain proper results in the manufacture. Such regulation is effected by hand. The Société Industrielle de Mulhouse, struck by the inconveniences of this method of procedure, opened a competition for an apparatus that should permit of an automatic regulation. As the apparatus described in this article is in reality merely a thermometer with dilatable rod, the manufacturer conceived the idea of employing it as a psychrometer by using two regulators, one with a dry receptacle acting upon the heating and the other with a receptacle surrounded by canvas kept constantly moist and acting upon the conduit of humidification.

A regulating psychrometer of this type was installed at the establishment of Scheurer, Lauth & Co., at Thaun, during the month of July, 1899, in a drying house of 1,000 cubic meters capacity. The results obtained were perfect. The dry and moist temperature did not vary more than half a degree; and, as such variation occurred in the same direction with both regulators, the result was that the percentage of humidity remained constant at about one per cent. Other apparatus also are arranged for giving a constant percentage of humidity, whatever be the temperature of the room.—Translated for the SCIENTIFIC AMERICAN from La Nature.

THE WAR AUTOMOBILE.

BY DAY ALLAN WILLEY.

The use of the automobile in connection with military service for mounting light artillery in this country originated with Major R. P. Davidson, commandant at the Northwestern Military Academy of Highland Park, Ill. Major Davidson has been experimenting with motor vehicles for several years, in making forced marches, long-distance tours, and in what might be called light artillery evolutions. Twice he has essayed to make a record trip from Chicago to Washington with an automobile carrying a gun crew of four men and a rapid-fire gun. Owing to the wretched condition of the highways, which was further aggravated by rainy weather, each time the trip has been abandoned when partly completed.

This year, the cadet corps of the academy has been organized to include a bicycle and automobile gun attachment, which is probably the only military organization of its kind in the world. The gun battery consists of two Colt automatic rapid-fire pieces of 7 millimeters caliber, each firing 480 shots per minute. They are constructed to utilize smokeless powder, and each is equipped with a bullet shield to protect the operator when in action. Each gun is manned by a sergeant and three privates armed with revolvers. The motor vehicles are operated by 10 horse power engines utilizing gasoline, giving a speed of 25 miles an hour on the ordinary country pike. The carriages have reservoirs with a capacity for 22 gallons of gasoline, and are equipped with acetylene lamps for night service. The front portion of the motor contains a foundation of sheet steel upon which the gun is mounted. The general design of the carriage was conceived by Major Davidson as a result of experi-

THE AUTOMOBILE FOR MILITARY INSTRUCTION.

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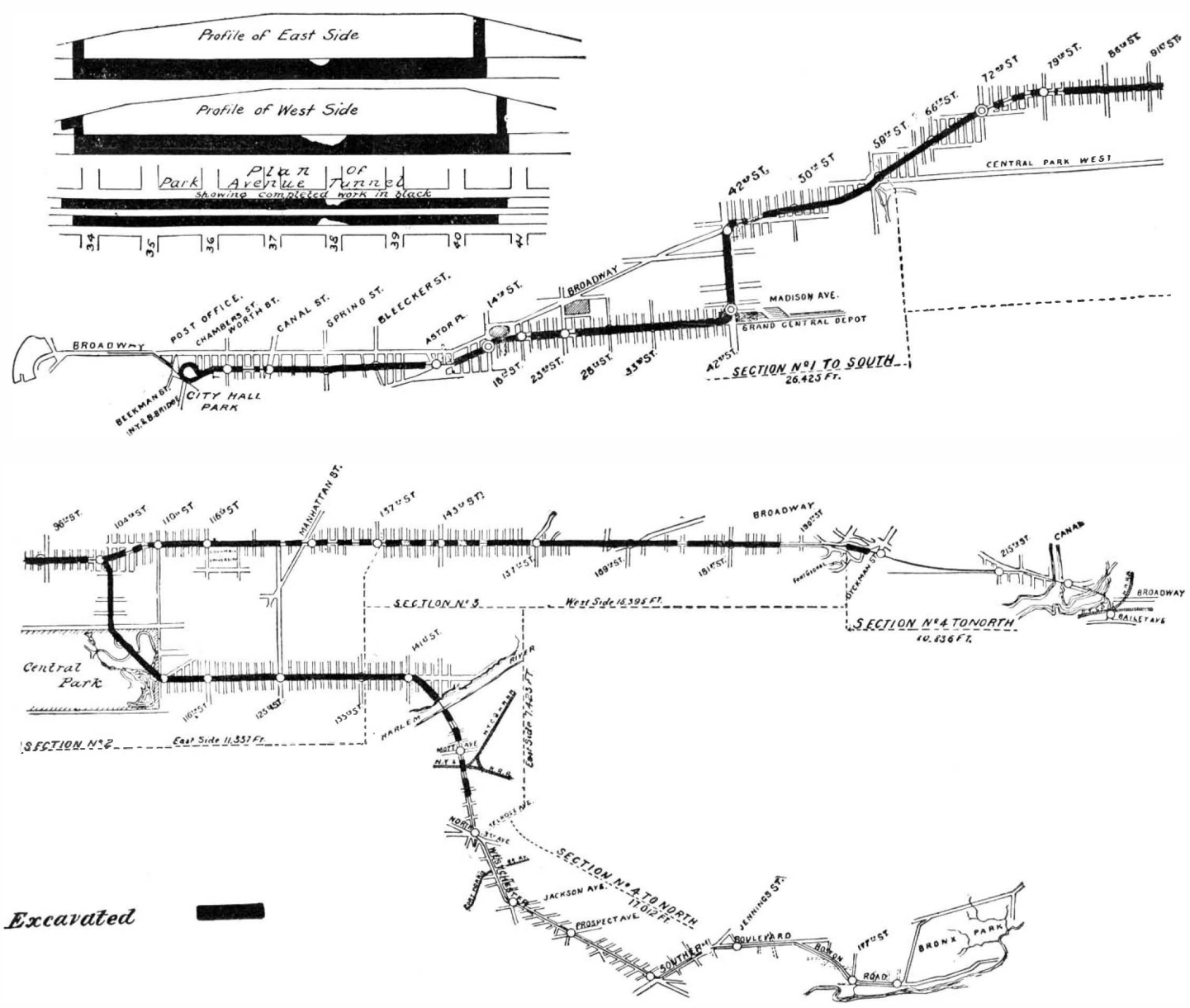
ments he has been making. The gun squad accompanies the bicycle infantry illustrated in the accompanying photograph, in marches through northern Illinois; and to test the ability of the vehicles cross-country, trips are frequently taken through cultivated fields and underbrush, the idea being to test the efficacy of the carriages as a substitute for horses in artillery service. The single-motor carriage depicted is the first motor which was tested by Major Davidson and was utilized in the attempted run between Chicago and Washington. It might be said that the same obstacle which resulted in the failure of Mr. Alexander Winton's attempted trip from the Pacific to the Atlantic coast, caused the failure of Major Davidson's attempt —the sandy condition of the highways.

THE RAPID TRANSIT SUBWAY, NEW YORK.

The construction of the great twenty-one mile system of underground railway known as the New York Rapid Transit Subway would be a notable feat of engineering, even if it were being built under what might be called normal conditions of traffic, such as may be found in the outlying and less thickly populated suburbs; but as a matter of fact, the difficulties of the work have been enormously increased by the condition that practically the whole of the tunnel lies immediately beneath the double tracks of the busiest street surface trolley lines in the city. These tracks being of the underground - trolley type are extremely heavy in construction, while most of the cars which traverse them are of the largest and heaviest type, and run under an unusually close headway, it being no uncommon thing for three or four cars to be on one block at the same time. Moreover, the subway lies, as we have said, for the greater part of its length beneath some of the principal arteries of vehicular traffic in the city, and it was laid down as one of the strict conditions imposed upon the contractors, that there must be no interference whatever with the operation of the electric tracks, and the least possible obstruction to ordinary street traffic. The problem of carrying the electric tracks while the solid ground beneath them was being cut away was no ordinary one, and considerable ingenuity has been shown in working it out. On the front page of this issue will be found a cross section taken on Fourth Avenue, showing the means adopted for supporting the trolley tracks and also the great number of gas, water and electric mains, while the earth and rock were being excavated, the steel framing built in place, and the concrete covering and the back filling and surface filling put in.



PLAN SHOWING IN BLACK LINES COMPLETED EXCAVATIONS ON NEW YORK SUBWAY.

The method of carrying the electric tracks was as follows: At the level of the street surface two pairs of 24-inch I-beams, 2 feet in depth and about 35 feet in length, were placed parallel with the tracks, one pair on each side thereof. At each end of the I-beams 12 x 12 posts were sunk to a firm foundation, and for the length of track covered by the I-beams the soil beneath the yokes carrying the tracks was dug out, and 12 x 12 timbers placed underneath them crosswise to the track. Heavy bolts were then passed up from the ends of the transverse timbers to the top flanges of the I-beams and drawn up snugly by nuts, the load of this stretch of track with the cars upon it being thus transferred to the I-beams. Similarly, 12 x 12 supporting timbers were placed from the I-beams to the adjoining sidewalks on either side, one end being bolted to the I-beams and the other resting upon the sidewalk flagging. The material was then excavated by pick and shovel, dumped into buckets of an overhead cableway, loaded into carts and taken to some convenient dumping ground. The timbers extending from the I-beams to the sidewalks served to hold in place and carry during the progress of excavation the numerous water, gas and electric mains, which lie immediately below the surface of the street. These were slung from the beams by stout chains, which held them securely in their proper level and alignment during the work of excavating. As the excavation was carried down, additional and longer 12 x 12 posts were put in place until subgrade was reached. The foundation blocks and concrete floor were laid and the steel columns and the I-beams of the roof erected, the side walls and the intervening arches of concrete built in place, and the back filling rammed in, completing the work. As the filling was brought up to grade, the chains supporting the gas and water mains were unslung and the 12 x 12 timbers removed, the surface of the street being finally restored to its original condition. The steel framing is spaced about 5 feet apart longitudinally and answers in some sense to the framing ribs of a modern steamship. The concreting between the side posts and between the I-beams of the roof is built in arched form to enable it better to resist the crushing pressure to which it is subjected.

The accompanying plan showing the progress of the work to date will be of considerable interest. On those portions of the road covered by heavy black lines, the work of excavation has been completed, while the intervening gaps represent the work that has been only partially excavated. Commencing at the loop under City Hall Park, we find that the excavation has been entirely completed, and, indeed, very little remains to be taken out, if we except the large station at the Brooklyn Bridge, as far north as Pearl Street. From Pearl Street to just below Canal Street but little work has been done. It was anticipated that on account of this ground having originally been a swamp, there would be considerable trouble with water, for which reason this particular stretch of line was left until the last. The contractors, however, are not experiencing any abnormal difficulty, and it is likely that the intervening gap of a few blocks will be completed by the fall of next year. From Canal Street to Astor Place the Subway has been entirely excavated, practically the whole of the steel work and concreting is done, and before many months the surface of Elm Street will have been repaved and put in first-class condition. From the south side of Astor Place to Ninth Street no excavation has been done, there being some dispute with the owners of the buildings underneath which the tunnel at this point will have to pass. From Ninth Street the excavation is complete, the steel work is in and most of the concreting completed to Fourteenth Street, where more than half of the excavation for the large Fourteenth Street station has been done and the balance of the work is being pushed forward with great dispatch. From Fourteenth Street to Seventeenth Street the solid rock has been excavated for three out of the four tracks, the steel has been put in, and the street restored to its original condition. Most of the excavation has been done for the Eighteenth Street station, and for the block immediately to the north of it. From Nineteenth Street to Twenty-third Street the work is nearly finished, as is the excavation for the Twenty-third Street station, which is about ready for the insertion of the steel framework. From Twenty-third Street to Thirty-third Street there is a practically unbroken stretch of completed Subway. The excavation is still going on for the Thirty-third Street station, and at the portal of the two-track tunnels which extend from Thirty-third Street to Forty-second Street. On both the east and west side branches of the tunnel on this stretch excavation is completed, and about half of the concrete lining has been put in place.

There is a gap of about one block opposite Vanderbilt Avenue on Forty-second Street, most of it solid rock work, upon which no work of excavation has been done; but from just west of Vanderbilt Avenue to Broadway the stretch of line through Forty-second Street is about three-quarters excavated, and a large amount of the steel work is in place and concreted up. There is another gap at Forty - second Street and Broadway, where work is being delayed by a dispute with the property owners, and but little work has been done as yet at Long Acre Square. From Forty-fifth Street to Seventy-second Street there is the longest stretch of completed line on the whole system. With a few exceptions this work is not only excavated, but the steel is in and concreted up and the street surface is largely restored. From Seventy-second Street to Eighty-first Street the work is somewhat backward. In places the ground is scarcely broken and there is here much work yet to be done. From Eighty-first Street to 100th Street, excavation is completed and much steel in place. There is considerable work to be done for two blocks south of 104th Street, where the four-track road divides into its western and eastern branches. From 104th Street to 110th Street on the west branch, the excavation is completed in stretches, while there are one or two blocks on which much work remains to be done. From 110th Street to Manhattan Valley excavation is practically completed, while about three quarters of the elevated structure across the Valley has been erected, and only awaits the delivery of the 160-foot steel arch over Manhattan Street to enable this fine viaduct to be completed. At present the structure is painted red, but ultimately, when it has been given its coating of olive green, it will present a thoroughly attractive appearance. The design of the bridge is more open and less cumbersome than the adjoining Riverside viaduct,

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and architecturally it will harmonize well with its surroundings.

North from the Manhattan viaduct to 149th Street the greater part of the excavation has been done, although there are occasional stretches on which merely the looser surface material has been taken out and the bulk of the rock work is untouched. It is but fair to add that on this section from 139th Street to 144th Street the magnitude of the work has been greatly increased over the original design, owing to the intention of forming here a large underground storage station for trains. The width of the excavation has been doubled from 50 to 100 feet, and over this stretch of line will be eight parallel tracks. There are portions of the line on which no excavation has yet been done, for the reason that the contractor is completing the steel work on a given stretch of line, so that when he comes to excavate the adjoining section, he can use the material taken out for back filling and surface filling on the finished structure. Practically the whole of the excavation of the solid rock tunnel from 150th Street to 186th Street has been completed, while about 500 feet of tunnel has been driven from the northerly slope of Washington Heights at Fort George southward along the route of the tunnel. Between the shaft at 181st Street and the entrance to the tunnel at Fort George is a distance of 4,338 feet. Of this 1,450 feet have been driven northward from 181st Street and this in addition to the 500 feet driven southwest from Fort George leaves 2,488 feet yet to be tunneled. At the rate of 100 feet a month which is now being made, this part of the tunnel should be completed in about two years' time, or a little before contract date.

On the easterly branch of the system the tunneling from 103d Street beneath Central Park to Lenox Avenue has been completed and the open excavation from 110th Street and Lenox Avenue to 141st Street is almost all done. Over most of this section the steel and concrete work is completed and the street surface restored. From 141st Street to the Harlem River the work of excavation is in progress. The crossing of the Harlem is an extremely interesting piece of work. It is being done by dredging and by the use of cofferdams of 12 x 12 sheet piling. Most of the preliminary dredging has been done across the river, and about half the width has been covered by a cofferdam, the pumping out of which is now in progress. In the Mott Haven district the Subway for some eight or ten blocks is in course of excavation, and a large amount of work has been done; while the foundations for the elevated structure have all been built from Jackson Avenue up to the Bronx Park.

While the building of the line is making good progress, it is satisfactory to note that the provision of motive power and equipment is also being pushed along expeditiously. The great power house between Fifty-eighth and Fifty-ninth Streets and Eleventh and Twelfth Avenues is making fair progress, the foundation having been completed, while the plans for the buildings and machinery have been definitely settled, and the contracts are being executed. Eight 7,500 horse power engines direct-connected to eight 5,000 kilowatt generators will form the initial equipment, the power house property being large enough to admit of additions as there shall be a demand for them. The General Electric and Westinghouse Companies are competing for the important contract of furnishing the cars, of which 600 will be called for at the opening of the line. In about a month's time, tests will be made of specimen cars which have been built by these companies, illustrations of which are given on our front page of this issue. The specifications called for a multiple-control system, three cars out of five, or with five cars out of seven or eight in a train being motor cars. Provision has already been made for the rail-laying to the extent of letting a contract to the Pennsylvania Steel Company for 10,000 tons of rail, weighing 100 pounds to the yard. In this connection it is well to suggest to the engineers of the Rapid Transit Subway that they should carry out exhaustive tests on different systems of track to ascertain which will be the least noisy for use in the tunnel. With the heavy local traffic and with express trains thundering through the tunnel at speeds of 50 miles an hour and over, it is likely at best to be a very noisy place, and care should be taken to adopt that system of ties and track which will give the most silent running.

The Alligator Extinct in the South.

The alligator is said to be practically extinct in the South. To Dame Fashion may be attributed his passing away. The demand for shoes, satchels and pocketbooks of alligator skin has been such within the last ten years that we will probably soon be compelled to visit our museums and zoos to hunt up the creature, which has unjustly earned an evil reputation as the terror of Southern swamps. Mr. J. Knight Perkins, of Kalamazoo, thoroughly searched the southern portions of the country for 14-foot alligators. In all New Orleans he could find but one alligator 10 feet long. He discovered that even little alligators from 4 to 8 inches long had disappeared from the market.

Correspondence.

Gravitation as a Cause of Volcanic Action.

To the Editor of the SCIENTIFIC AMERICAN:

Your correspondent in the issue of August 9, writing on "Gravitation as a Cause of Volcanic Action," evidently doubts that certain planetary positions cause electrical disturbances in the earth, and that volcanic and seismic action may be caused by electrical or magnetic influences. But let us consider carefully the evidence in favor of these propositions.

We know that magnetic earth currents (which interfere with telegraphing), brilliant auroras, severe thunderstorms, violent storms of many kinds, and also earthquakes and volcanic activity accompany sun spots. All these are electrical disturbances, and the eruption of Mount Vesuvius and numerous seismic shocks which occurred at the time of the last large sun spots—about September 15, 1898—were no doubt electrically caused by them.

The moon's equatorial passage has certainly no gravitational influence, and yet it must be something more than mere coincidence that severe volcanic and seismic disturbances have accompanied this planetary position every time during the past four months, with but one exception: None were reported for June 27; but the abnormally severe storms on and about that date proved the electrical effect. The moon's last equatorial passage, on August 21, caused terrific earthquakes in Mindanao, Philippine Islands, and a violent eruption of Mont Pelée on that date, more shocks at Los Alamos, Cal., on August 20, 21 and 22, earth-tremors for two hours in Austria and violent tremors near St. Petersburg on the 22d, and an eruption of Mount Allomonte, Italy, beginning the same day. All these were two to four days after full moon and half-way between apogee and perigee.

Within twenty-four hours of the direct opposition of Saturn on July 17, there were terrific tremors on St. Vincent Island, cloudbursts in Illinois, a tornado in Ontario, and a typhoon at Hongkong—all electrical disturbances.

The recent severe earthquakes at Los Alamos, Cal., began a few hours after the very close conjunction of Mars and Neptune on July 27, and were most severe on that night and on the 31st, when Mercury was again in perihelion, and the day before perigee.

Mercury is found to have more influence in causing seismic and volcanic action than almost any other planet—probably because of its eccentric orbit, nearness to the sun, and frequent periods. About fifteen hours before the superior conjunction of Mercury on August 11 at 4 A. M., there was a severe earthquake and tidal wave at Juneau, Alaska, and there were frequent shocks at Los Alamos from 4 P. M., August 9, to 12 P. M. on the 12th, the most severe one occurring at 2:40 P. M. on the 10th. Mercury's equinox of August 27 probably caused the eruption of Mont Pelée on the afternoon before.

All the other earthquakes and volcanic eruptions reported in the newspapers during July and August, with but two exceptions, came just as expected according to this astronomic theory. Among these were the violent eruption of Mont Pelée on the evening of July 9—described and illustrated in the SCIENTIFIC AMERICAN of August 16—and also those on the 10th and morning of the 11th, the moon crossing the equator on July 10.

As to the electrical disturbances that accompany volcanic eruptions being "caused by the heat from the volcano"—as your correspondent maintains—that is, of course, partly true; and this electrical energy might also "touch off" other volcanoes; for I have certainly not altogether mistaken effect for cause, and these remarkable and constantly-recurring coincidences furnish a good proof that seismic and volcanic action may be electrically caused and that certain planetary positions, such as close conjunctions and oppositions, equinoxes, perihelions and perigees, cause electrical disturbances in the earth and also, probably, throughout the solar system.

Similar effects would probably result when several planets come directly into line with each other or with the sun, although not in line with the earth, and also if most or nearly all of the twenty other satellites should cross their primaries' equators at nearly the same time. Planetary positions of this kind must have occurred on May 20 and August 14.

The best way, it would seem, to prove and perfect this astronomic theory of volcanic action would be to compare the times of greater and less activity in some perpetually active volcano, like Stromboli, in the Mediterranean, or Sangay or Cotopaxi, in Ecuador, with the prevailing planetary positions. Here is a suggestion for the "international convention of scientists for the study of seismological problems," which—according to an Associated Press dispatch—Emperor William of Germany is endeavoring to bring about for next spring.

Just how certain planetary positions cause electrical disturbances in the solar system or disturb the electrical equilibrium is a subject for theorizing and investigation; but however difficult it may be to understand does not disprove the idea in the face of the evidence. There are many things we cannot explain the whys and wherefores of, such as the X-rays, wireless telegraphy, telepathy, clairvoyance, etc., but that should not prevent us from believing in and making use of these principles of nature. The scientific investigator must seek simply the truth, without bias or prejudice, no matter if reasons are not apparent.

The most probable dates in the coming two months for seismic and volcanic disturbances to begin or to reach a maximum are September 1, 3, 11, 17, 22, 23, 30; October 1, 10, 15, 16, 19, 23, 27 and 30.

Livermore, Cal. ELMER G. STILL.

New Automobile Records.

Alexander Winton, seated in his famous "Bullet," broke all records on September 16 at the first annual meet of the Cleveland Automobile Club. The "Bullet" was started in the 10-mile open race against H. S. Harkness, of New York, who rode the Mercedes with which he won the majority of the prizes at the Brighton Beach races. After the first mile, which was made in the comparatively slow time of one minute and twenty seconds, the "Bullet" increased her speed. The time for the ten miles was ten minutes fifty seconds. The last five miles was made in five minutes and nineteen and one-quarter seconds. Twice during this 10-mile race Winton covered a mile in one minute two and three-quarters seconds. In the pursuit races run on the same occasion Winton established the record of one minute two and one-half seconds in the second mile.

Rollin White at the same meet drove his steam machine five miles in six minutes and forty-three seconds, which is a new record for that type of vehicle.

The world's records for speed have been beaten at the Deanville races, which were held on the 26th of August. Deanville is one of the principal French watering places, and the annual races which are held here are always of great interest. As at Nice, the track is a cement avenue bordering the sea. The race consisted of a kilometer dash (0.6 mile) and over 600 yards of track were allowed before the start in order to get up to speed. A great crowd of chauffeurs was assembled at Deanville, and most of the leading makes were entered. M. Serpollet had constructed two new racers which resembled the one he used at Nice, except that the new machines are pointed at both ends, being somewhat boat-shaped. There are places for two persons in the middle, but the latter are nearly concealed within the body. The race was held under favorable conditions as to weather, and a rather strong wind was blowing behind the chauffeurs, which may have had some effect on the speed. It was a Mors car which broke all previous speed records, and made the kilometer in 26 2-5 seconds, which is a speed of 78.6 miles an hour. This machine, which was piloted by Gabriel, belonged to the automobile class (maximum weight 2,200 pounds). Chauchard came just behind Gabriel, lacking only 1-5 second, thus making the kilometer in 26 1-5 seconds. He was mounted on a Panhard & Levassor racing car of the Paris-Vienna type, weighing 2,175 pounds. One of the Serpollet racers came next in 27 1-5 seconds. A Mors car followed in 28 seconds. It was piloted by Levegh and weighed 2,195 pounds. Rigal, on a Buchet motocycle, made 28 4-5 seconds, as also a Panhard car of the automobile class. The German machines, of which there were two of the Mercedes type entered, also made a good record, 32 and 32 4-5 seconds. The lightweight class (up to 1,430 pounds) was headed by the Decauville, which made 30 1-5 seconds. It weighed 1,430 pounds, and was piloted by Théry. A Serpollet car mounted by Rutishauser made 31 1-5; its weight was 1,408 pounds, and it had a 12 horse power motor. The world's record of speed is now beaten by 1 4-5 seconds. It was held by Jarrott, who made 28 1-5 seconds at Welbeck on the 22d of August, thus beating Vanderbilt's record of 29 2-5 seconds on the Achères route.

The Current Supplement.

The current SUPPLEMENT, No. 1395, opens with a fully illustrated article on the manufacture of fresh-water pearl buttons. Mr. Edward P. Thompson writes on the inherent nature of coherers; and Prof. Henri Moissan tells of his new method of manipulating liquefied gases in sealed tubes. Electricity has not been neglected, for the SUPPLEMENT contains a fully illustrated article on "Some Uses of Electrical Pumping Machinery," and a description of the electrically-operated Belgian-Ougree blast furnaces and steel works. A resumé of the year's work in astronomy by Poincaré will be found of interest. The second installment of a review of the "Existing Methods of Cultivating Anærobic Bacteria" is published. Among the minor articles may be mentioned those on "Italian Bell Towers," "A Simple Form of Fuel Calorimeter," "Calcium Carbide from Non-Electric Furnaces," "Foucault's Pendulum" and "Treasures of Savages."

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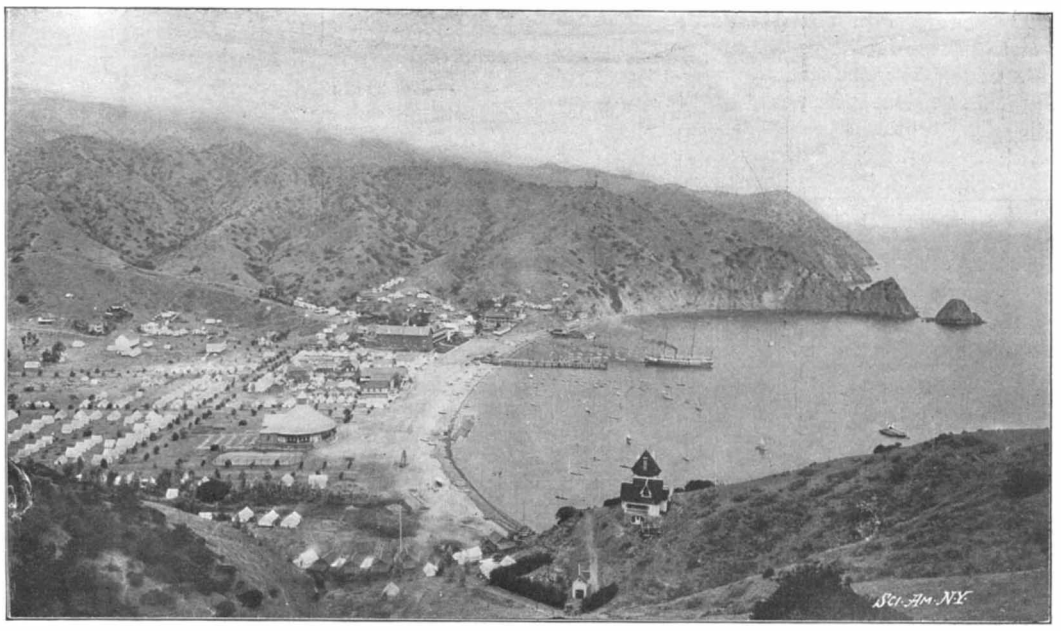
TOWN MAKING A SCIENCE.

BY CHARLES F. HOLDER.

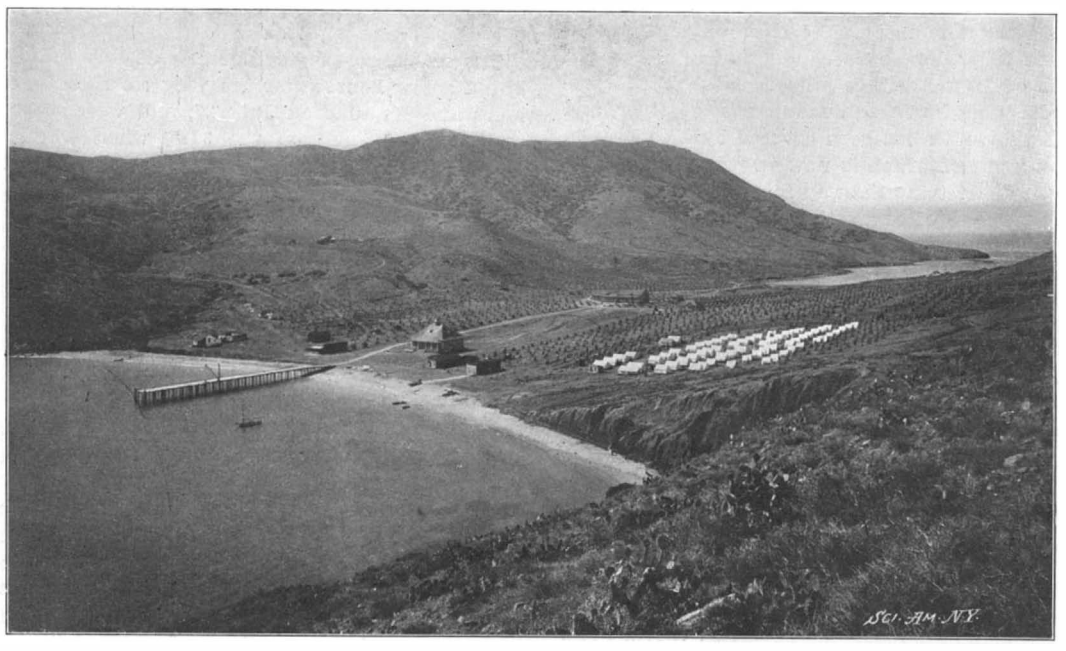
The erecting and continuance of a large city is an art, but the making of a town or city to order, and carrying it on without a hitch of any kind by a corporation, is certainly a science. The Pacific coast affords an excellent field for the political economist or for the person interested in the factors which enter into, not the struggle for existence merely, but the struggle for the comforts of life at a minimum cost, as here can be seen the remarkable annual birth of towns and so-called cities, which blossom as the rose for a brief time, then melt away. Here also is the land where the order is given by some large land owner to make a town, which forthwith is made, all involving most interesting phases of life.

Such an order to build a town was recently given at Santa Catalina, one of the group of islands including San Clemente, San Nicolas, Santa Barbara, Anacapa, Santa Cruz, San Miguel and Santa Rosa, strung along the Californian coast from Point Conception to San Juan, the first-named being the only island having a regular town and regular boats. Avalon has a winter population of perhaps one thousand, but in summer six or more thousand, having sixty thousand visitors during the year. It stands in a wide cañon, but is more or less restricted, and as it was evident that the time would come when another town would be needed, the owners ordered a new town. The site selected was at the north end of the island on a little bay, called the Isthmus from the fact that a deep fjord cuts in from the west, giving the locality two most attractive harbors. When the order was given to make the town the place was a desert, not a tree in sight, only a few shanties of fishermen alongshore and here and there a patch of cactus. Water was the desideratum, and this was found in a neighboring cañon to the north and piped over the hills. The ground was now leveled by an enormous amount of labor, the hollows filled, and small prominences cut down. The surveyor then came, who platted the tract, laid it out into streets, avenues, walks and a central plaza or park with provision for fountains. This accomplished, the plumbers stepped in and a system of sewerage and water pipes was introduced. The aid of the forester was next called into play, and the streets and avenues were planted with small Australian eucalyptus trees, so small that they could hardly be seen. This was two years ago. A wharf was built, a hotel or restaurant, several cottages for the superintendent or pseudo mayor, a number of tents erected, and what is known as the "tent city" was finished. The tent city is a feature peculiar all along the Southern Californian coast, for the benefit of ranchers and others from the inland cities and towns who desire to escape the heat and enjoy life at the seashore at a minimum cost.



THE "TENT CITY" AT AVALON, WHEN FIRST ESTABLISHED; TREES JUST PLANTED ON SOIL THAT WAS COVERED WITH CACTUS.

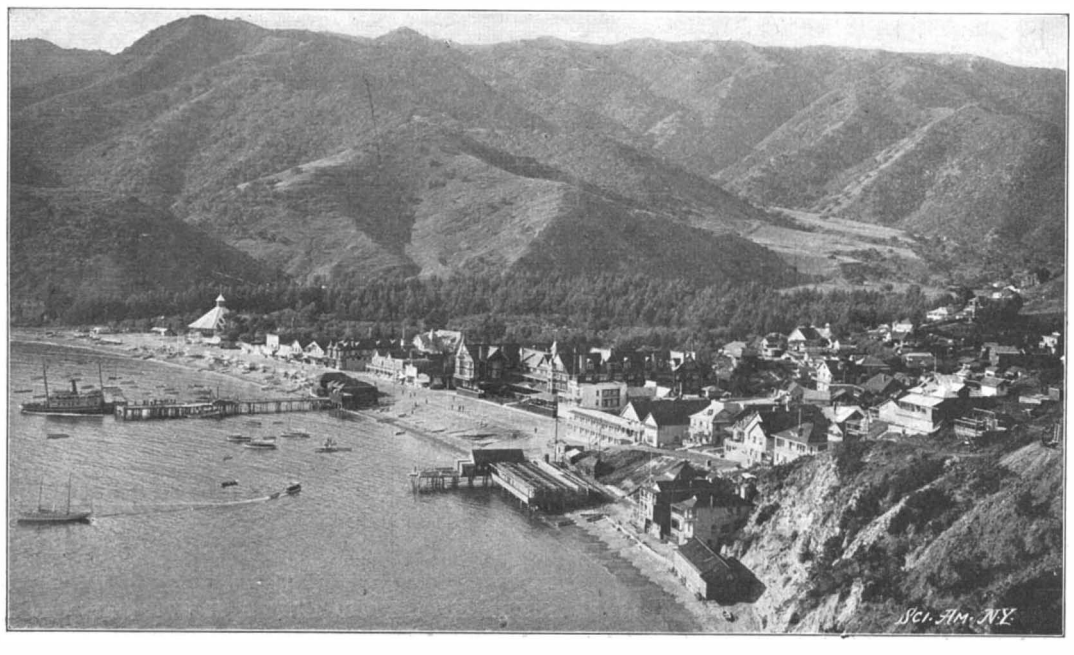
The town at the Isthmus is not designed wholly as a tent city, but is to be provided with cottages and hotels, and the owners are merely waiting for the trees to grow before this is accomplished, and this is well shown in the accompanying illustration. The trees are now in some instances twenty feet in height, and well illustrate the rapid growth of trees in Southern California. Where there is an abundance of water, eucalyptus trees will attain a height of one hundred feet in ten years. Certain acacias, as the black wattle of Australia, will attain a height of sixty feet in eight years; the live oak, supposed to be a very slow grower, twenty-five feet in fifteen years, if plentifully supplied with water. The date and fan palms are equally rapid growers in this country, and all illustrate the possibilities of creating towns with forests grown to order. In 1890 there were but few trees at Avalon, but to-day it is filled with a dense growth of trees which afford a most grateful shade. Two of our illustrations show the growth of about three years and the evolution of the town.



TOWN MAKING IN CALIFORNIA; SHOWING EUCALYPTUS TREES IN THE TOWNSITE TWO YEARS OLD.

What is known as the "tent city" is more or less peculiar to California, and the local papers, from the heart of the Sierras to the sands of the ocean, during the summer months, all contain glowing advertisements of the "tent city." Such cities, with a population of several hundred, are found at Long Beach, Newport and Coronado and in lesser degrees at many points. The equipment of the "tent city" constitutes a business in itself. At Avalon the writer was shown a large circus tent which in winter contained furniture of every description, carpets, matting, oil stoves, dishes, lamps and other household articles by the score. Here were also tents of all sizes, floorings, in fact the "tent city" was here in winter quarters, everything classified and arranged with order and system. In April or May a gang of men descends upon the winter quarters, and like magic the vacant lots are filled, the floors fitted, tents erected, carpets laid, furniture placed, water turned on, and presto! in a day a city is reared as though by the touching of the proverbial button. Each tent is neatly and well furnished, and can be rented for a nominal cost, the owners of the island giving the ground rent and free water, each lot being sewered and perfect in its sanitary arrangement. The visitor can rent a tent for sleeping, a parlor and kitchen, or he can rent a single room. In the center of the "tent city" is a store where every description of food carefully prepared and cooked can be obtained. Nearby the Y. M. C. A. has opened a reading room and library.

The question of the physical and moral welfare of such a community would seem an important and difficult one to manage; but all this and even the amusements are included in the plan, and we have a city where every door is open and where probably the jail is used hardly once in the season. On the borders of the city is a large hall or pavilion arranged as an amusement hall, and in the immediate grove is a band stand where the finest band in Southern California gives an open-air concert from seven until nine, seats being provided for twelve hundred people. No smoking is allowed within the area of the seats. At the end of the concert the band adjourns to the "pavilion," and a ball is given free to the inhabitants of the "tent city" and others. No policeman is in evidence in the town, though guardians of the peace are present in citizen's clothes. In fact, here is a summer municipality of large size, run or conducted by a corporation that attends to everything; keeps the town clean, provides amusements, sustains a health officer, administers justice through a justice of the peace, provides the government with a post office, and maintains two daily boats between the island and the mainland—an experiment in government worthy the attention of the pessimist who affects to believe that communities cannot be run by machinery, as this virtually is, so well arranged and systematized are the methods. It might be assumed that a series of stringent and excessive taxes would be imposed upon each resident, but investigation shows that each resident of the tent city of Avalon pays but $2.75 per capita per season for the privileges, which is the cost of the round trip fare from Los Angeles to the island, a distance of fifty miles, more or less. This and the rent of tent constitute the sole tax. This town building idea, so successful in Southern California, is worthy of trial along the Atlantic seaboard as a plan for securing an outing during the heated term for hundreds who would otherwise have to stay at home.



SHOWING SITE OF A TENT CITY, AFTER THREE YEARS OF FOREST GROWTH (EUCALYPTUS.)

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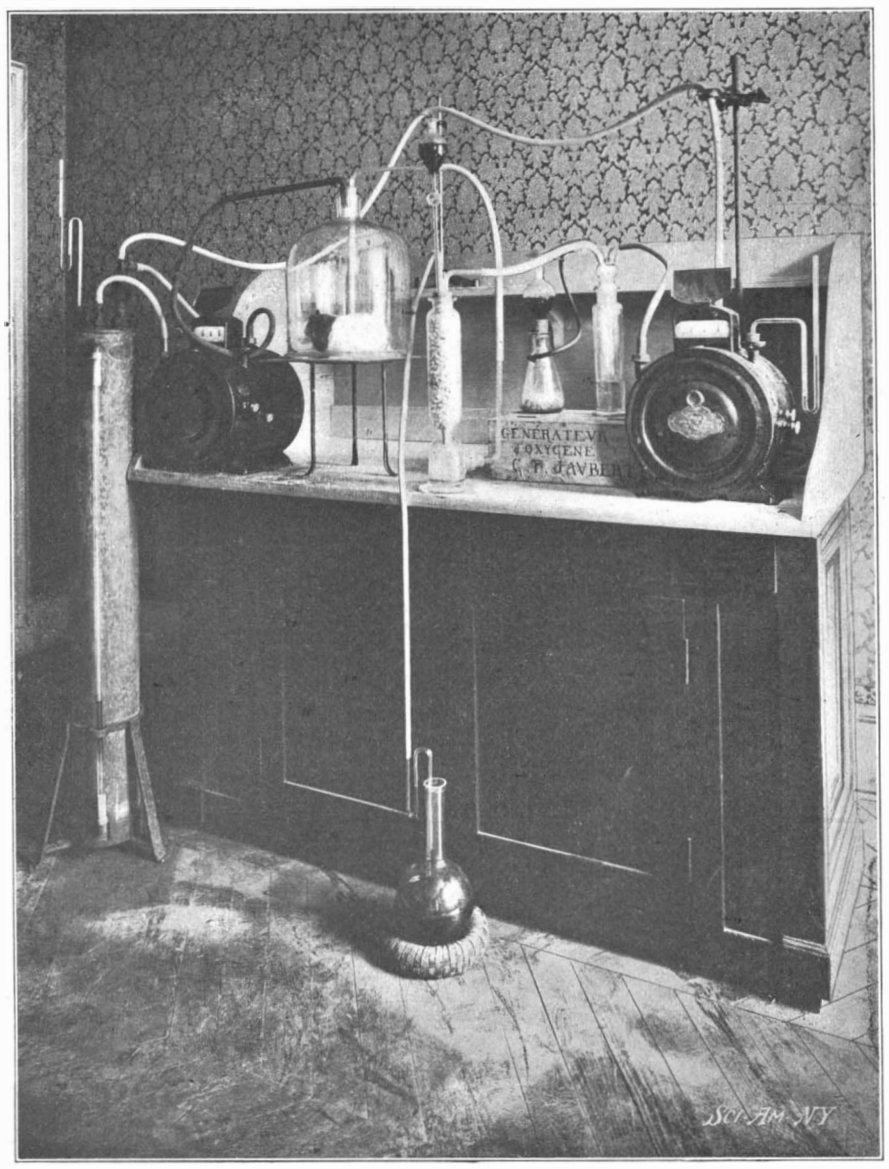
Detecting Blood-Stains.

A new method of distinguishing human blood stains is now being employed with some success. It is the practical result of the experiments made by Bordet in 1898-99. He showed that by injecting defibrinated blood of an animal into animals of different species, the serum of the latter animals acquired the property, after a certain time, of agglomerating and dissolving the red corpuscles pertaining to the species whose blood had been injected. The serum thus obtained has been called *cytolitic*. He also showed that this serum, when mixed with defibrinated blood of another species, furnished at the end of a few minutes a red liquid, clear and limpid, while if added to the serum of the first animal whose blood had been used to prepare the cytolitic serum it gave an opaque liquid which soon formed a flaky precipitate. It is this observation which Uhlenbach has applied to the diagnosis of human blood. He injected every 6 or 8 days about 10 cubic centimeters of defibrinated beef's blood into a rabbit, and after five injections he obtained a serum which dissolves beef's blood exclusively. By taking a one per cent solution of the blood of 18 different animals and adding 6 or 8 drops of the serum obtained from the rabbit, he found that all the tubes except that containing the beef's blood remained perfectly limpid, while the latter became cloudy and gave finally a woolly precipitate. A series of similar experiments upon human blood gave the same results, and he was able to distinguish between the former and beef's blood in samples which had been dried for over a month. The researches of Wassermann and those of Schultze in which human blood has been compared with that of 23 different animals, confirm those of Uhlenbach, and the precipitate was obtained only with human blood; one exception must be made, that of monkey's blood, which at the end of a certain time gave a very slight precipitate. The method is very efficacious, and blood which is three or four months old may be detected in this way, where other methods would fail. The experimenters state that the material of the blood stain to be examined should be soaked in a small quantity of a normal salt solution, and after filtering, the liquid is divided in equal parts in two test tubes. To one is added a few drops of the serum of a rabbit which has undergone the treatment with human blood, and to the second, the serum of an untreated rabbit. A third tube contains diluted blood of another kind of animal and to it is added another portion of the serum of the first rabbit. The tubes are kept at 37 deg. C. and if at the end of an hour the contents of the first tube become cloudy and then precipitate while the other two remain clear, it is certain that the spot is that of human blood, except in the remote case where monkey's blood might be considered.

The popular interest in the so-called Correspondence Schools continues to increase, so that new institutions in this line are pursuing new measures to gain the attention of future patrons. One of the latest ideas is the consolidation of the American School of Correspondence of Boston with the Armour Institute of Technology of Chicago, Ill., whereby the corresponding students may have the advantage of the new institute in finishing any course they may take by personal study at the institute. Under the system arranged, the marks the corresponding student receives will be given due credit in the institute.

THE JAUBERT METHOD OF PRODUCING OXYGEN GAS.

M. George F. Jaubert, an eminent scientist of Paris, has invented a method for producing oxygen which is extremely simple and cheap, and will no doubt find numerous applications. The inventor has been working in this direction for a number of years with a view of finding a body which would produce oxygen in a manner analogous to the production of acetylene by carbide of calcium.



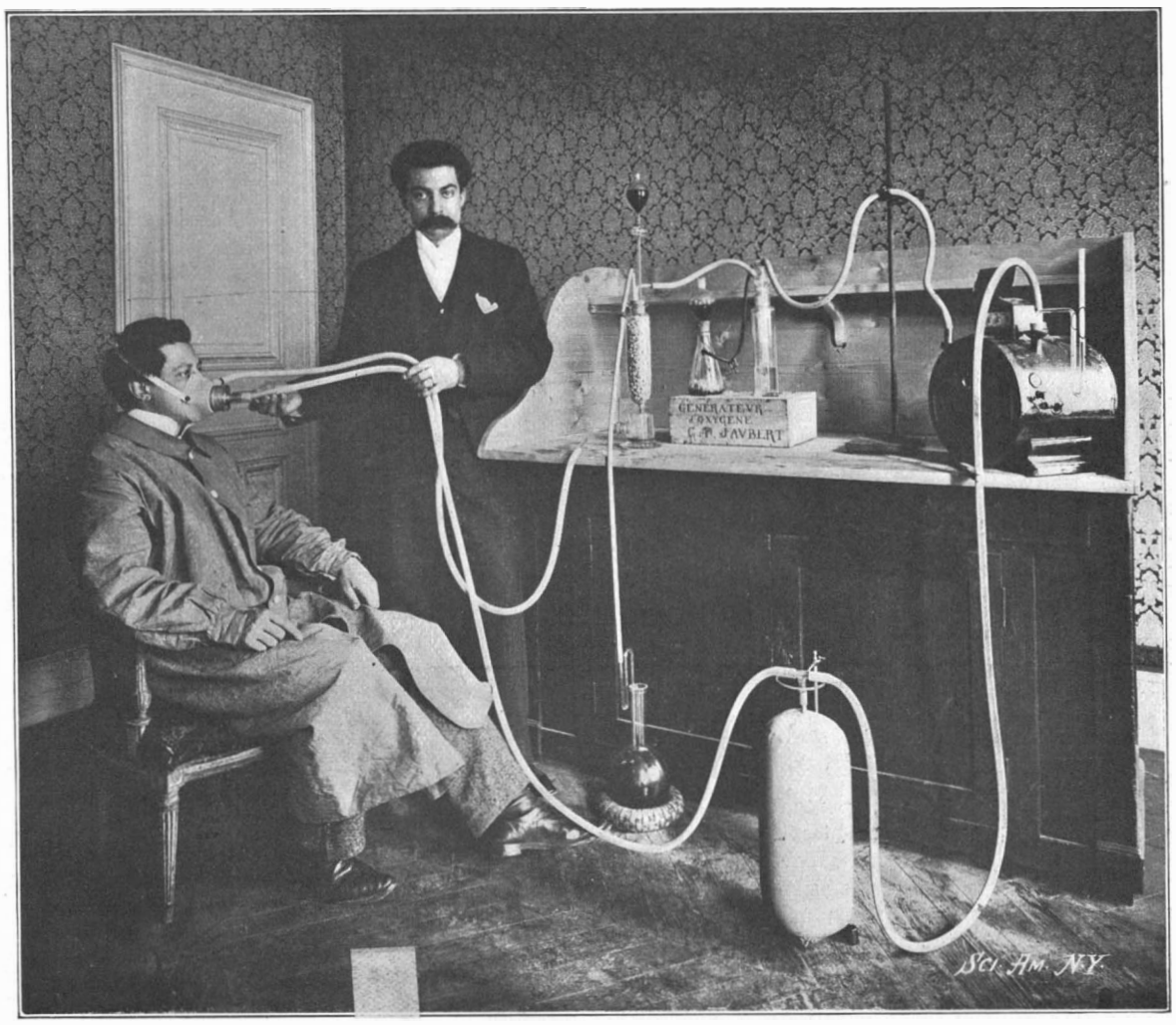
EXPERIMENT OF KEEPING ANIMALS ALIVE WITH THE JAUBERT CONTINUOUS PROCESS OXYGEN APPARATUS.

He has been studying the subject with reference to artificial respiration, to be applied to diving apparatus and especially to submarine boats. The latter question is one of great importance, and if the recent experiments can be relied upon, a great step in advance has been made. Peroxide of sodium or potassium is used to prepare the oxygen. These compounds are very rich in oxygen and will give it off again in the pure state by a proper decomposition. The peroxides are generally formed by heating the metal in a current of oxygen, when they absorb the gas in variable proportions, forming a series of higher oxides. These bodies are generally decomposed by water and it suffices to place a small quantity of peroxide in a vessel of water, when a violent disengagement of oxygen takes place.

M. Jaubert has found a method of manufacturing these bodies by the electrochemical process at a low cost, and at present a large hydraulic plant has been erected in the Isère district. For commercial use this body takes the form of compressed blocks about 1½ inches cube, or small pellets ½ inch in diameter. These are used in a gas-generator in the same way as carbide and the supply of oxygen given off is regulated in various ways. The advantages of such a method of producing oxygen need not be dwelt upon; the prime material is in a very compact form and gives a supply of gas at a moment's notice. The product, known as "oxylithe," is now on the market, and its price may reach as low as 10 cents per pound. One pound of oxylithe will furnish 75 to 125 liters of gas.

One form of gas generator is shown in the engraving and section. The oxylithe in powder is placed in the hopper, *A*, above the water reservoir; the mouth of the hopper is closed by a ball, *C*, which is connected above to a flexible diaphragm, *D*; the latter may be loaded with weights. At first the powder falls into the water and the gas is generated. When the pressure rises above a certain point, it acts upon the diaphragm, lifting the weights, and the ball closes the orifice, and *vice versa*. The output may thus be regulated by the load upon the diaphragm. This form is designed for laboratory use. On a large scale, apparatus No. 2 is used. Here the pieces of oxylithe are fed into a central tube, *E*, and fall upon an inclined platform, *F*, giving off gas and finally reaching the bottom. The gas passes off by the upper tube, *G*, and is generally passed into a water-cooled chamber to condense the water vapor.

One of the chief applications is the production of "artificial air." M. Jaubert has made a number of experiments by which it is possible to maintain respiration for an indefinite period in an inclosed space. The engravings show such experiments with artificial respiration. A guinea-pig has been made to live for a number of hours inside a bell-jar; the carbonic acid gas which it gives off is sent into an oxygen generator and its supply of oxygen is renewed in the right proportion. The renewed air is sent into the bell-jar by a second tube, thus forming a closed cycle entirely separated from the exterior air. To the left of the bell-jar is an aspirator for setting up the circulation in the apparatus. The carbonic oxide passes first into a cleaning apparatus, then into the oxygen generator on the right, and returns to the bell-jar through a gas-meter. An analogous method is used for human respiration; the bell-jar is replaced by a mouth-piece with the proper tubes (as shown in the engraving). In this way a person may live for a great length of time entirely out of contact with the external air, depending only on the supply of oxylithe. Diving apparatus has been



THE JAUBERT RESI IION EXPERIMENTS WITH OXYGENIZED ARTIFICIAL AIR.

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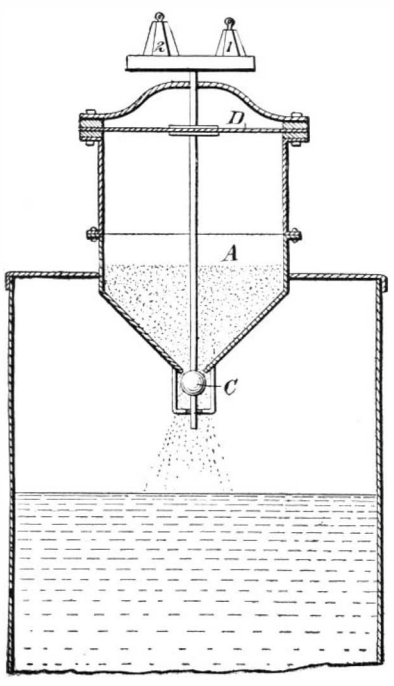
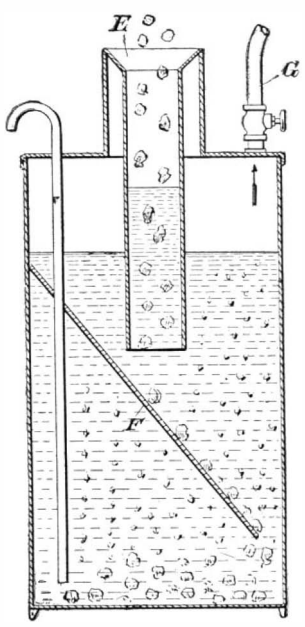
equipped with a system of this kind made in compact form and placed inside the helmet. To keep up the respiration of one person during an hour required but 0.2 to 0.3 pound of oxylithe.

No doubt the most important application of artificial air is that to submarine boats, and it is in fact to this end that the efforts of the inventor have been mainly directed. The Minister of the Marine has taken an active interest in the matter and a number of experiments are now being made at St. Denis, near Paris. These relate to two different points, first to the question of respiration when the submarine is under water, and next to the use of a petrol motor with a supply of artificial air, in place of an electric motor with accumulators. As to respiration, allowing 10 persons for the equipage, 2 pounds or more of oxylithe will maintain the respiration of the crew for one hour, representing a cube of 4 inches of the compound. A supply for a long period is thus contained in an insignificant volume. A still more novel idea is to utilize the oxygen for supplying the petrol motor when used under water. In the present systems such a motor can only be used at the surface. When submerged, accumulators are generally used, which drive an electric motor. The weight of the battery is, of course, very great for the amount of power which it furnishes, this being estimated at 150 to 200 pounds per horse power, not to speak of the large amount of space it takes up, just where space needs to be most economized. By using a petrol motor supplied with oxylithe the weight of the latter is but 5 to 10 pounds per horse power. The distance to which a submarine can travel when submerged is, of course, limited to the weight of battery it carries, and is very small; by using a corresponding weight of oxylithe the range would be enormously increased, due allowance being made for the supply of petrol and difference of motor weight. The petrol motor here has its exhaust connected with a discharge-box and thence to a scrubber and an oxygen generator. The oxygen consumed in the motor is here renewed in the right proportion and the product is ready to be used again. This forms a closed cycle, out of contact with the air; when the boat is at the surface, a simple arrangement of valves allows the air to be used and the generator is shut off. The motor can be run while submerged for a period depending only upon the supply of oxylithe (and petrol) which is carried. Another point is that the resulting mixture is richer in oxygen than the air, and the output of the motor may be increased 25 to 30 per cent. Motors using heavy petroleum work especially well with the oxygenated mixture and much better than with air. The experiments now being made with petrol motors near Paris are very interesting, but have to be kept secret for the present. It may be stated that a large petrol motor of about 130 horse power, such as may be applied to a submarine, is being tested in this way. The exhaust gas passes into a cylindrical oxygen-replenisher about 7 feet high and 3 feet in diameter and other apparatus, and is then returned to the motor, where it is recarbureted and used over again. These experiments have been quite successful and will no doubt be practically applied to a submarine of the "Goubet" type before long.



JAUBERT LABORATORY OXYGEN GAS GENERATOR.



FORM NO. 2 JAUBERT OXYGEN GAS GENERATOR.

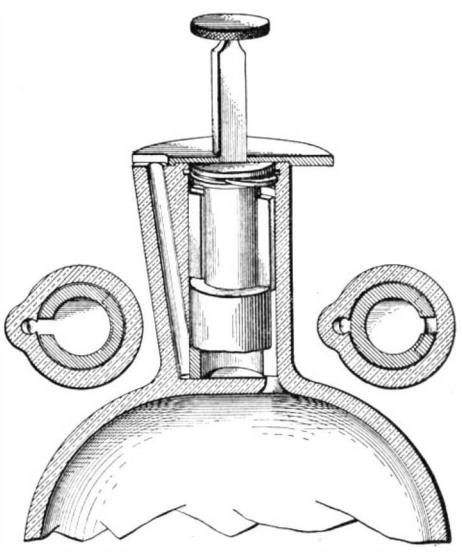
Patent Department

ODDITIES IN INVENTIONS.

LIFE PRESERVER.—Two inventors in Switzerland have designed a life preserver which not only prevents drowning, but will also sustain life for an indefinite period, and, further, is equipped with a sail by means of which a shipwrecked person may make his way to a passing vessel or eventually reach shore. A hollow tank fastened to the back serves to keep the person afloat, and a provision and drink chamber is fitted on the chest. This chamber is divided into three compartments, the lowest containing drinking water, the next an alcoholic stimulant, and the third serving as an air chamber to support this weight. Access to the water and stimulants may be had through tubes which lead up within easy reach of the mouth. Condensed food is carried in three tins on the top of the water tank. A compass also is here secured, to which may be fastened a chart of the course the wrecked vessel was pursuing. A number of blank cartridges and a pistol are also provided for use in attracting attention, and a signal of distress floats from the masthead. Surely the shipwrecked mariner thus equipped need have little fear of Old Father Neptune.

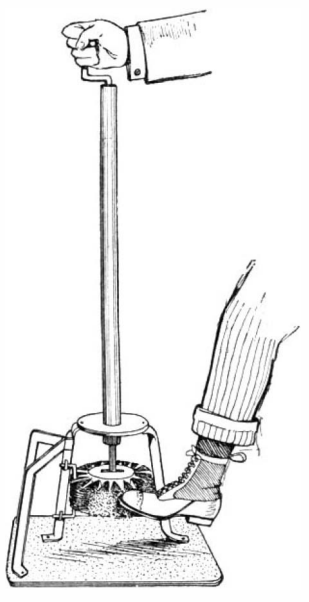
LIFE PRESERVER.

NON-REFILLABLE BOTTLE.—A recent invention by Mr. James Y. Payton, of Waldron, Ark., provides a non-refillable bottle of an entirely new type. Fitted snugly in the lower portion of the bottle neck is a hollow dispensing cylinder divided at one side by a slot. A piston having a rib for engagement with this slot is adapted to slide freely in and out of the cylinder. A shank of the piston passes through a cap-piece which prevents the removal of the parts from the bottle. The cap-piece is held by spring dogs snapped into an angular groove in the bottle neck. This groove is provided with shoulders which permit turning of the cap and plunger in one direction only. The operation in dispensing the liquid is as follows: The plunger is forced down into the chamber and then turned until a tooth on the plunger engages a rib formed in the neck of the bottle. This act brings the slot of the dispensing cylinder into registry with an opening in a bottom wall which separates the neck from the main body of the bottle. The plunger is now raised to the position illustrated, when the tooth will clear the rib formed on the bottle neck, and the bottle is then inverted, permitting the liquid to fill the dispensing chamber. A half turn of the piston now brings the rib formed thereon into engagement with the rib on the bottle and the slot of the dispensing cylinder into registry with an outlet port which extends upward into the form of a tube to the mouth of the bottle. The cap-piece by the same act is turned so as to uncover the mouth of this port. The liquid may now be freely poured out of the dispensing cylinder. Before the dispensing cylinder can be turned to its refilling position, the plunger must again be forced in so that the rib formed thereon may pass under the rib of the bottle. This it will be seen prevents refilling of the bottle because the plunger would force out any liquid contained in the dispensing chamber before the latter could be turned into registry with the opening in the bottom wall of the neck.



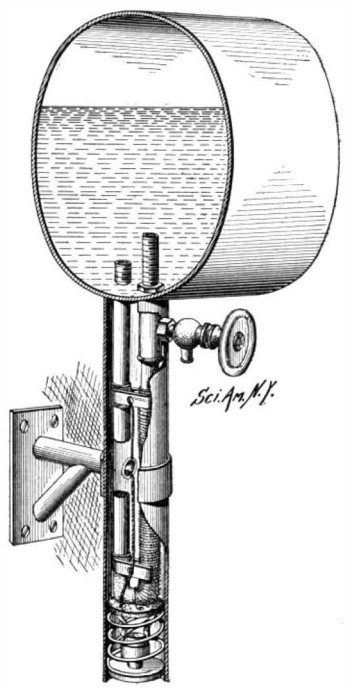
NON-REFILLABLE BOTTLE

SHOE-CLEANING MACHINE.—We have long been in need of a shoe-cleaning device which would not only scrape the mud off the soles of shoes, as with the ordinary scraper, but would also remove mud and dust from the uppers. These requirements are met in the shoe-cleaning machine recently invented by Mr. William Richardson, of Colfax, Wash. The machine comprises a number of scrapers which are used to give the shoe a preliminary cleaning, and a rotary brush for rapidly and thoroughly removing all dirt. This dirt is removed from bristle tufts of the brush by a rod against which the brush is rotated, so that clean bristles constantly operate on the shoe. As the brush wears off, this cleaner-rod may be adjusted inwardly to effectively engage the bristles.



SHOE-CLEANING MACHINE.

ELECTRIC WATER-HEATER.—For persons desiring a quantity of hot water on short notice, the water-heater here shown will prove particularly valuable, though it will be found useful on all occasions requiring hot water. The device is designed to rapdly heat flowing water, or if used in connection with a reservoir, to heat water circulating therefrom and thus store up a quantity of hot water. The reservoir or water tank, as shown, is provided with two pipes connected at their lower ends by a U-shaped coupling. One of these pipes, which is provided with means for heating the water contained therein is longer than the other pipe, so that as the water is heated it will flow to a higher level in the tank and the cooler water will pass down through the shorter pipe, thus keeping up a circulation. A discharge cock is connected with the hot-water pipe, through which the water may be drawn off as required. The heating device consists of a fine wire, wound in coils about the pipe, the latter being covered with an insulating coat of mica or other equivalent insulating substance. The wire offers a high resistance to the electric current passed through it, and sufficient heat is thus generated to heat the water. The heat of the wire cannot rise much beyond that of the pipe, because of the continuous circulation of water, so that no fear may be entertained of burning out the wire. The circuit can be closed or opened by operating the plug at the bottom of the device, which is adapted to slide between two spring contact pieces forming the terminals of the heating medium.



ELECTRIC WATER-HEATER.

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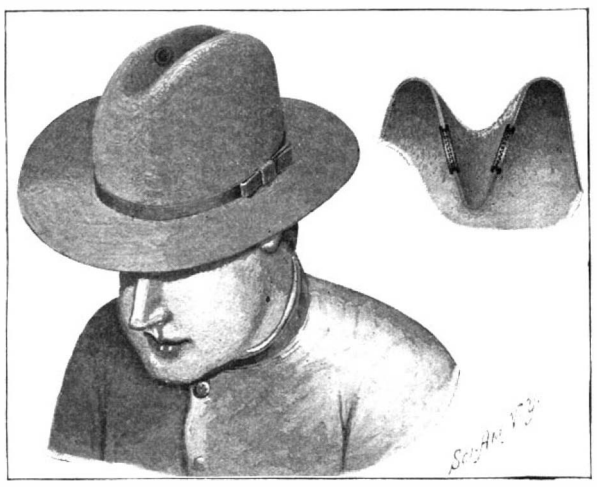
VENTILATED HAT.

Residents of tropical countries will appreciate the value of an improvement in ventilated hats, recently patented by Mr. Julius Wolbrecht, Chief Clerk Quartermaster Department of Works, Manila, P. I. The engraving shows the improvement as applied to a campaign or slouch hat, and the arrangement is such that the hat is not only properly ventilated. but, in addition, the rays of the sun are prevented from penetrating the ventilators and striking the head of the wearer.



VENTILATED HAT.

The slouch hat is formed with the usual crease in the crown and on the side walls of this crease the ventilators are placed, preferably near the top. Each ventilator consists of a piece of wire gauze secured to an eyelet fastened to the wall of an aperture made in the wall of the crease. By arranging the ventilators in the manner described, a proper ventilation of the hat is attained, especially as the air within the hat, and particularly the hottest air, usually located in the uppermost portion of the hat, can readily escape through the ventilators, thus keeping the head of the wearer comparatively cool. It is evident that, as the ventilators are arranged on the side walls of the crease, the rays of the sun in penetrating through the meshes of the ventilators cannot strike the wearer's head, but instead strike the sides of the crown of the hat, consequently the wearer is not liable to suffer from the direct rays of the sun, as is so frequently the case when the ventilators are located either in the top of the crown or on the side. Furthermore, it will be seen that the ventilators are hardly visible and the appearance of the hat is not impaired.

GURGLESS JUG.

The accompanying illustration shows a jug provided with an air passage leading down through the handle,

A GURGLESS JUG.

whereby air is freely admitted into the vessel to replace the liquid as it is poured out. The advantages of this air passage are apparent. All gurgling sounds incident to the discharge of the liquid are prevented, and a rapid and uninterrupted flow is assured. An important feature of the invention, though one that might possibly be overlooked, is that the mouth for the air passage does not open in the handle, but instead is located in the neck of the jug, so that by using a stopper with an enlarged head, such as the one illustrated, this opening may be closed. Thus air is excluded from the contents of the jug and dust is prevented from accumulating and clogging the air passage.

The members of the Patriotic League of the Revolution are endeavoring to establish the claim that Theodore R. Timbey was the inventor of the armored revolving turret which is popularly ascribed to Ericsson.

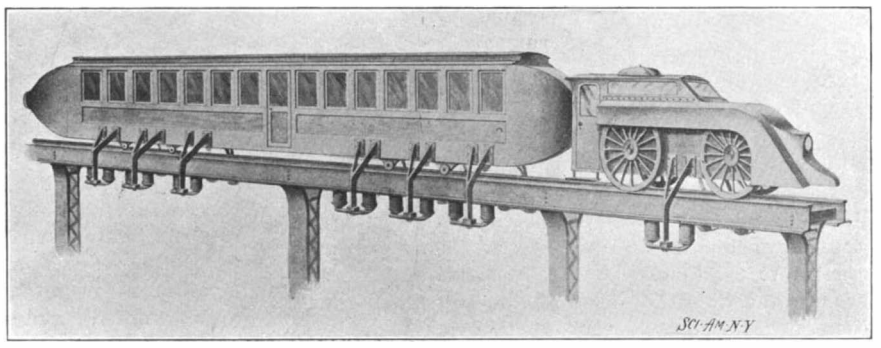
A New Match.

Another kind of match, intended to supplant the phosphorus matches which have been prohibited for a year, has lately been introduced in the Swedish market. The inventors of the new match are the engineers Landin and Jernander, of Stockholm, who have patented their invention in several countries. This match looks like the well-known potash and paraffin matches, which, however, by reason of the fact that they contain poisonous phosphorus, come under the same prohibition as the old and worthy lucifer match. But the new match, which has been named "Repstickan" (the scratch match), possesses a property which the potash match lacks, viz., it is damp proof and can, therefore, be lighted against a damp or wet surface, provided this is hard. The inventors claim that Repstickan is the least poisonous match in existence, the safety match not excepted.

The manufacture of the new matches, which at present is carried on for the inventors, has been intrusted to Lidköpings Tändsticksfabrik. It is said that negotiations are going on for the sale of the patent in other countries.

MAGNETICALLY-SUPPORTED TRAIN.

A curiously interesting invention for railway trains is that shown in the accompanying illustration. The object of the invention is to overcome the weight of the train by the use of magnetism, thus reducing friction to a minimum. The car and locomotive, it will be observed, are provided with arms or brackets which extend downward from each side, bending under the rails to support a series of powerful magnets. These magnets are energized by storage batteries in the cars or by a central power station through the medium of a trolley wire. The magnets are arranged to slide along the under faces of the rails, lifting themselves and the cars to which they are attached, so that the car wheels just clear the upper surfaces of the rails. The wheels, indeed, are required merely for an emergency in case the magnetism should give out. A device may be provided under the control of the engineer for accurately adjusting the power of magnets, so that their upward pull will exactly balance the downward pull of gravity. The engine would require some weight upon its drivers to overcome the inertia of the train and control its movements on grades, when the equilibrium will be destroyed. No fault can be found with the plan theoretically, and on a small scale the invention is perfectly practicable; for a properly-constructed magnet is capable of sustaining about 168 pounds per square inch of its contact surface. We leave it to our readers to figure out, however, the size of magnets required to lift a modern fifty-ton parlor car, and the probable expenditure of power necessary.

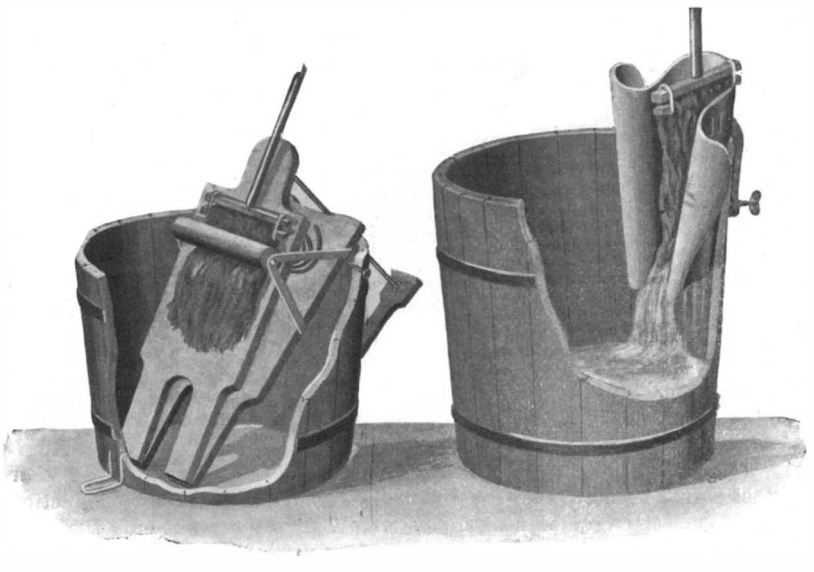


A MAGNETICALLY-SUPPORTED TRAIN.

MOP-WRINGERS.

A cheap and effective mop-wringer will prove itself indispensable in any house or building. We have here illustrated two very simple forms which will be found useful. In one of these inventions, the wringer is permanently secured to a pail. Fastened within the pail is a base-board, to which a presser-board is hinged at its lower end. A spiral spring seated between these boards serves to press the presser-board against the squeeze-roll mounted in brackets from the base-board. Hinged to the outside of the pail is a foot lever which has connection with the presser-board. In operation this lever is forced down, depressing the presser-board, whereupon the mop is placed between this board and the squeeze roll. The foot lever is now released and the mop slowly drawn upward. The water is thus thoroughly wrung out and it runs down the board into the pail. During these operations the pail is prevented from upsetting by placing a foot on the foot step, provided on the exterior of the pail.

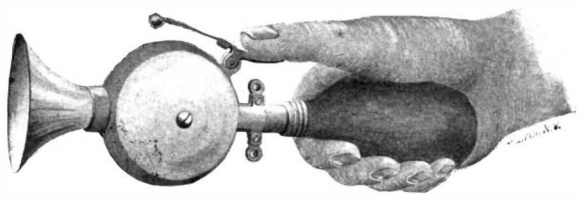
The second invention provides a detachable device consisting of a hollow conical receptacle tapering downward, one side being open and forming a mouth provided with wide flaring lips. This is secured to the pail by a thumbscrew, and ribs are provided on the wringer to rest against the sides of the pail and prevent twisting. In operation the mop is drawn into the mouth between the flaring lips and twisted as shown, then a downward pressure of the mop causes the water to be freely expelled through perforations in the side walls of the wringer.



TWO FORMS OF MOP-WRINGER.

COMBINED HORN AND BELL.

A French inventor has devised a combined horn and bell for the use of bicyclists. Upon the tube of the horn he fastens, by means of screws or other appliances, an ordinary bell, which is rung by means of a clapper fulcrumed adjacent to the bell and provided with a thumbpiece to facilitate its manipulation. It is obvious from this arrangement that it is possible for the bicyclist simultaneously to sound the horn by pressing the bulb and to ring the bell by working the clapper with the thumb.



COMBINED HORN AND BELL.

A Prize for Women Inventors.

The Boston Women's Educational and Industrial Union has offered a prize of $50 for the best household labor-saving device invented by a woman. Particulars can be obtained by addressing the Home Economic Committee, 264 Boylston Street, Boston, Mass. The prize is not very lucrative, but the device for which it is offered can be patented, if new, and thus give to the inventor something tangible to sell in the way of manufacturing rights.

Walter Bernard secured a small tract of land a few miles east of Olympia, Ore., and stocked the place with a few dozen chickens. As he is compelled to be away from home during the day, he studied out a scheme for caring for his chickens during his absence. In each yard he has erected troughs to hold food for the hens, and these troughs are connected by wire with his house. Within the house Mr. Bernard has connected the wire with an alarm clock, with the usual battery attachment. When he leaves home in the morning he sets the alarm clock at the hour for feeding the chickens, and, by an ingenious arrangement, when the time arrives the alarm goes off, the connecting wire releases the troughs and the chickens make a rush for their feed, which is spread before them as if Mr. Bernard did the job in person.

A company has been organized, composed mostly of Pittsburg men, with a capital of $1,600,000, which will engage in the manufacture of a new system of block signaling apparatus, the invention of George W. Cohen. This system obviates what is called the relays, and it has been tested a number of times in actual operation and its efficiency has been fully demonstrated, it is said.

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Brief Notes Concerning Patents.

If the reports of the daily press are to be credited, Alexander Graham Bell is the inventor of an airship which is shortly to be tested. As usual, no one but the inventor knows anything of the structural features of the contrivance.

Edwin D. Brainard, an inventor, mechanical engineer and architect, well known all over the country, died at his home in Pittsfield, Mass., on July 9. He was seventy-three years old, and his death was directly due to a shock sustained a week before. He was the inventor of the Brainard cold storage system, which has been installed all over the world for the purposes of refrigeration, which was the means of carrying his name far and wide.

Up to the first of May there had been fifty-seven patents granted covering wireless telegraphy or the parts of the instruments used in the transmission of messages by the wireless systems. The first was granted to A. E. Dolbear on October 5, 1886. Thomas Edison received the third patent in this line, and he has another patent issued in 1891. The first one issued to Marconi was in July, 1897, and since that time he has taken out eleven others, the last of which was dated June 11, 1901. Tesla has taken out seven patents in this field of invention.

Prof. Reginald Fessenden, the inventor of a system of wireless telegraphy with which the United States government is experimenting, has announced his intention of resigning his position in the Weather Bureau early in September, and soon after that the company which has been organized to exploit his invention will be ready to engage in commercial business. Stations equipped with his instruments will be located along the Pacific coast at an early date, and will be used in the dissemination of the weather reports through that part of the country.

C. Henry Wernle, an inventor and maker of delicate mathematical instruments, died recently at his home, No. 2650 Bockius Street, Philadelphia. He was born in Germany, and came to this country when a very young man, and for fifty years had been employed by the United States government at the Frankford arsenal. Many of the instruments now in use at that institution were of his invention and manufacture, and his secret of tempering fine and delicate instruments is said to have died with him, for he repeatedly refused to impart it to others.

A stone of granite to the memory of John Fitch, who was identified with the early history of the locomotive and the steamboat, has been erected in Warminster township, Bucks county, Pa. The stone was presented to the Bucks County Historical Society by Edward Longstreth, of Philadelphia, and that organization placed it on the spot where Fitch is said to have conceived the idea of propelling carriages by power. He worked on this thought for a while, and abandoned it to devote his time to a boat driven by power. The latter experiments were commenced in 1781. The memorial is nine feet high, and two feet square at the base.

A handsome monument will be erected to the memory of Matthew Baldwin, the founder of the Baldwin Locomotive Works, in Philadelphia, which recently completed its 20,000th locomotive. It will take the form of a bronze effigy on an imposing base, and will be placed in a small park which belongs to the city, but which faces the offices of the company.

Charles E. Yetman, a Western telegraph operator, is the inventor of a machine for sending telegraph messages by a typewriter. The idea, to be sure, is not new; nevertheless Mr. Yetman is said to have made some important improvements. His invention consists of a typewriter and telegraph instrument combined. The latter is so arranged that, by striking a key, the Morse letters are plainly and accurately produced. Wires connect the machine with the telegraph line.

Capt. Charles C. Dickinson, of the General Land Office at Washington, D. C., is the inventor of a lifeboat and a new means of launching such craft, which was given a successful trial from the deck of the steamer "Kent" recently. The boat is made of steel, and with the exception of the middle is covered with a rounded top. At each end is a water-tight compartment large enough to accommodate several persons. Entrance to these compartments is secured through doors which are closed to keep out the water and which are supplied with heavy glass to permit those inside to see out. These shelters are ventilated by funnels which are arranged to close automatically in case of the capsizing of the boat. The craft is so weighted that it will always right itself in the heaviest sea. The new system of launching does away with any gear or tackle or davits. The keel of the boat rests on a cradle so connected with rollers that on being slightly elevated the boat with its occupants shoots out of the cradle into the water. The tests given at Washington were successful in every particular.

Legal Notes.

THE RIGHT OF PRIVACY.—A trade-mark case of unusual interest was recently decided in the Court of Appeals of New York State. The case in question, Roberson vs. Rochester Folding Box Company and the Franklin Mills Company, appelant, involved the right of the defendant to use the plaintiff's portrait as a poster in advertising the Franklin Mills Flour. In this State no precedent for such an action is to be found in the decisions of the Court of Appeals. For that reason the decision now handed down is one of considerable legal importance. Chief Justice Parker, who wrote the prevailing opinion, held that the right of privacy, founded upon the claim that a man has the right to pass through this world without having his picture published, his business enterprises discussed, his successful experiments written up for the benefit of others, or his eccentricities commented upon, would, when recognized to the fullest degree, result not only in a vast amount of litigation, but litigation bordering upon absurdity. For the right of privacy once legally asserted, it would necessarily be held to include the same thing if spoken instead of printed; for one, as well as the other, invades the right of privacy. On grounds, therefore, of public policy, and on examination of the authorities which have indirectly dealt with similar cases, the Court was led to the conclusion that the so-called right of privacy has not as yet found an abiding place in our jurisprudence, and that the doctrine cannot now be incorporated among our legal principles without doing violence to settled principles of law. It therefore seems that there is no possible means of preventing one's picture from being used as an advertisement. But the plaintiff always has his action in tort if he can show that he has suffered actual injury. Furthermore, the New York Penal Code provides ample punishment for the malicious publication of pictures.

In his dissenting opinion, Mr. Justice Gray holds more liberally that an individual has a right to privacy which he can enforce, and the invasion of which equity will prevent. The right of privacy, in Judge Gray's opinion, or the right of the individual to be let alone, is a personal right, which is not without judicial recognition and is the complement of the right to immunity of one's person. The common law regarded individual personal property as inviolate. When, as here, there is an alleged invasion of some personal right or privilege, the fact that early commentators on the common law have not discussed the subject is of no material importance in awarding equitable relief. Judge Gray takes the broad view that because the preventive power of a court of equity has not hitherto been exercised in analogous cases no valid objection can be made to the assumption of jurisdiction in the particular circumstances of the present case. The performance of an act by a defendant which is wrongful, because constituting an invasion in some novel form of a right to something which is conceded to be the plaintiff's, and as to which the law provides no adequate remedy, should be enjoined.

The case came up before the Court on demurrer from the Appellate Division, the opinion of which was reversed, the Court standing four for reversal and three for affirmance.

GEOGRAPHICAL AND DESCRIPTIVE WORDS AS TRADE-MARKS.—The old matter of the use of geographical and descriptive terms as trade-marks has once again been aired in court, and once again been decided in the long-established way. The latest case was that of Draper vs. Skerrett, decided in the Circuit Court, Eastern District Pennsylvania (116 Fed. Rep. 206). The plaintiff purchased from France a thin emollient paper dressing for corns, known as "Papier Fayard," which he put up in a different and more useful and attractive form, and sold under the name of "French Tissue." By that name it became known in this country. Through an arrangement with plaintiffs, defendants acquired the sole right to handle this preparation in certain localities, plaintiffs furnishing specially-colored envelopes upon which their names appeared as proprietors. Subsequently defendants began putting up and selling a similar preparation for themselves under the same name of "French Tissue," employing a dress, both as to the squares of paper themselves, the envelopes in which they were sold, and the advertising circulars inside, closely simulating that of plaintiffs. The court held that whether the relation of defendants to plaintiffs was that of sales agents or merely customers, it was clear that they were attempting to take advantage of that relation. It was held, therefore, that the plaintiff was entitled to an injunction restraining defendant from using not only the simulated dress, but also the name. Apart from the question of unfair competition, the words "French Tissue" as applied to a paper dressing, originating in France, cannot be appropriated as a trade-mark; the first being broadly geographical, and the second descriptive of the texture of the paper.

A GERMAN PATENT DECISION.—The German patent law ordains that three years after the grant of a patent it can be declared void if the owner of the patent neglects to work the invention by practically making and distributing the patented article, or at least to take the necessary steps for doing so. On the strength of this provision of the law, application was made to the Patent Office to declare void a patent for an American type-setting machine, as also six additional patents granted to the same owner for separate articles having a technical connection with the machines. The Patent Office denied the application, and the case being appealed to the Imperial Supreme Court (tribunal of last resort in Germany) the latter sustained the decision of the Patent Office as far as the patent for the type-setting machine (the main question) was concerned, on the ground that the owner of the patent had made reasonable—though unsuccessful—efforts to find customers for his machines. As to the other six patents, the application to void them was granted, the defendant having admitted that the manufacture of the articles covered by them in Germany would not prove profitable and therefore he did not intend to work these patents practically.

DESIGN PATENTS.—The United States Circuit Court for the District of Connecticut recently held the Scranton design patent for a design for a bell intended to be used on automobiles not to be infringed and void for lack of patentable novelty, at the same time laying down these general rules. The fundamental question in determining the validity of a design patent is whether the inventive faculty has been exercised to produce something which is original and pleasing to the eye. In design patents, the test of identity on questions of anticipation and infringement is the eye of the ordinary observer, and in determining such question the court may avail itself of such common knowledge as is possessed by the general public.

PURE INVENTION.—Two claims of the Parramore patent for a new stocking supporter to be used in connection with corsets, and having as its main and novel feature a single connection with a stud or clasp of the corset, thus dispensing with all other means of attachment thereto, have been held infringed, in the United States Circuit Court of Appeals. "Notwithstanding the apparent simplicity of the improvement," says the court, "the record discloses the labor and experiments required to produce a patentable supporter fastened to the front of the corset by a single point of support on the corset, and the inventive character of the device is made apparent despite first impressions as to triviality."

SCOPE OF INVENTION.—Where an inventor has made and patented a thing which is novel, but which performs in part the functions of each of two old structures, his selection of the name of one of them for his invention, as being approximately descriptive, should not be held a limitation which deprives him of the right to protection, save as to the features of his invention which are appropriately described by such name; nor, on the other hand, can he escape anticipation by a prior structure because it was given a different name, where the functions of the two are substantially the same.

TRADE-MARK OF FRAUDULENT BUSINESS.—"Equity will not protect a trade-mark for a patent medicine, the statement on the label of which asserts a falsehood, and being designed to deceive the public," announces Justice Briscoe, of the Maryland Court of Appeals, in a case involving the right to use a label for a medicine. The statement referred to was "The great smallpox and diphtheria cure and preventive. Cures the worst cases without marking, unless already scabbed."

Much space is devoted in the daily press to the suit of John Brislin against the Carnegie Steel Company for patent infringement. Brislin was once a roller, and, in conjunction with Antoine Vinnac, invented a patent table for carrying hot ingots of steel to and from the rolls mechanically. Vinnac died two years ago, leaving his interest to Brislin. The royalties which Brislin will collect, if he eventually succeeds in his action, will amount to many millions. The case will be appealed.

LIABILITY FOR USE BY PURCHASER CONSTITUTING INFRINGEMENT.—While one selling a patented device for a use which would be an infringement might be liable as a participator, he would not be liable for an improper use made by the purchaser afterward, and not contemplated in making the sale. (Cary Mfg. Co. vs. Standard Metal Strap Co., 113 Fed. Rep. 429.)

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RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

FLAX-HARVESTER. — D. L. WELLMAN, Frazee, Minn. Mr. Wellman has invented a flax harvester which is light, durable, simple, and effective in operation, and which will automatically cut up the ground and loosen the roots of a plant, draw them from the ground, and feed them to the rear portion of the machine, where they are received on a suitable carrier.

Apparatus for Special Purposes.

CARRYING AND TRANSFERRING DEVICE.—J. H. SINNOTT, Brooklyn, N. Y. This carrying device is designed more especially for use in printing establishments. It is arranged to insure accurate piling of sheets of paper on a transferring-carriage and to facilitate the transfer of the pile from the store-room to the machine and from one machine to another without much exertion on the part of the operator.

BONE-BLACK KILN.—W. T. MOHR, Gladerun, Penn. This kiln is more especially designed for dyeing, revivifying and decarbonizing bone-black, fuller's earth, and like materials. The kiln is arranged to relieve the material under treatment of all gases and moisture previous to its entrance into the revivifying retorts and to insure a high-grade product ready for efficient use in the purifying of sugar, petroleum oils and the like.

Hardware.

LATCH.—O. H. BURDEN, Kaslo, Can. A door-latch of simple construction has been invented by Mr. Burden which may be easily applied to any door, which can be opened from the outside only by the use of a proper key, which may be quickly opened from the inside, and which is capable of adjustment from the inside to a confined, inoperative position, wherein the latch-bolt is held retractive and flush with the outside face-plate.

CORKSCREW.—R. RUNNALS, Westerly, R. I. This corkscrew is so constructed that it may be readily loosened in the bottle neck without the operator pulling on the corkscrew. A sleeve surrounds the corkscrew, and is designed to engage with the cork. A bar is arranged transversely in the sleeve for engaging the screw. This bar riding up the inclined plane of the screw under spring pressure will cause the cork to become loosened.

Mechanical Devices.

BORING AND DRILLING MACHINE.—B. E. HERVEY, Ritzville, Wash. This boring and drilling machine is in the nature of an improvement upon a similar machine previously invented by Mr. Hervey. The present invention embodies certain features and details of construction whereby the usefulness of the machine is greatly extended.

SELF-WINDING CLOCK.—C. HOUR, 7 Rue St. Anastase, Paris, France. This clock is automatically wound up by means of a device which works under the sole influence of the variations in the temperature of the atmosphere, the expansive and contractive properties of certain liquids being employed for this purpose.

FIRE-ESCAPE.—H. VIEREGG, Grand Island, Neb. This fire escape belongs more particularly to that class which are adapted to be operated by the weight of a person descending to the ground. The device consists of a frame or block-containing mechanism whereby a cord when actuated by the weight of a person decending causes certain parts to act as a brake, thereby governing the motion.

FIRE-ESCAPE.—A. SFERLOZZA, New York, N. Y. This fire escape comprises a movable scaffold whereby the inmates may be conveyed to the ground. The scaffold is arranged to be raised between the windows of two consecutive flats so that the occupants may escape from the two flats at the same time, or it may happen that the refugees are located in one particular flat, while the fire may be advantageously attacked from another. In that event the scaffold may be so disposed that the firemen are free to fasten the hose lines to the plugs of one flat while the refugees are being taken from another.

Railway Improvements.

BRAKE MECHANISM.—D. S. SEBASTIAN, Wallace, Idaho. The invention relates to railroad cars, street cars and other vehicles traveling on rails, and it provides an improved brake mechanism arranged to brake the vehicle to a gradual or comparatively sudden stop by applying brake power on the rails instead of on the wheels, thus preventing undue abrasion of the wheel treads.

Vehicle Accessories and Harness.

SULKY.—J. B. TAIT, Highbridge, N. J. The wheels of this vehicle are so arranged as to have a lateral swinging or tilting motion with relation to the sulky axle so as to prevent side slipping of the vehicle while turning curves and incidentally to relieve the wheel of consid[illegible] lateral strain.

OVE[illegible]-CHECK FOR BRIDLES.—J. B. Sch[illegible]ncy, Ill. The invention provides a neat and simple overdraw check to be connected with the crown-piece and with means of supporting the blinds of a bridle. The parts are readily interchangeable, as one part can be removed and replaced by another without inconvenience and with little or no work.

Miscellaneous Inventions.

LAST.—J. D. WINCHESTER, Beverley, Mass. This invention provides a certain novel construction by which a last may be more readily disconnected from the shoe, thus avoiding the possibility of tearing or disturbing the shape of the shoe in the operation of removing the last.

MEANS FOR DECORATING FABRICS.—ANTOINE VÉRICEL, New York, N. Y. The invention provides an improved stencil by which the desired color of paint may be quickly applied to the fabric by an unskilled operator. Different colors may be easily and quickly applied by the successive operation of a series of stencils each embodying a part of the pattern and adapted to apply one color, the series of stencils being normally held out of the way and adapted to be brought into matching relation over the work before the color is applied.

HOLLOW GRATE-BAR.—T. J. PRITCHARD, Sunshine, La. Mr. Pritchard has invented a hollow grate bar which is adapted to cause thorough ventilation in the fire and to some extent act in the capacity of a smoke consumer. The bar is adapted to be placed under a boiler and is preferably connected with an air-chamber, so as to result in comparatively perfect combustion.

HYDROCARBON-BURNER FOR STOVES OR FURNACES.—G. A. GREENE, Rogers, Texas. In this improved burner the liquid is vaporized within a confined space by causing it to splash upon a suitable obstacle against the inner surface of a heated air-tube. This vapor combines with the heated air to form a good combustible mixture. An absorbent charge for the non-vaporized liquid is supplied to the burner and is adapted to feed fuel thereto for a short time after cutting off the fuel supply.

NON-REFILLABLE BOTTLE. — J. J. BENTZ, Brooklyn, N. Y. The invention relates to a means for preventing bottles being filled after their original contents have been withdrawn. The neck of the bottle is provided with a plunger valve which falls to its seat when the bottle is upright, but when the bottle is tilted the valve opens and the liquid is allowed to pass out freely.

CUSPIDOR-RACK.—F. F. BALL, Sonora, Cal. Mr. Ball provides a simple construction of rack which may be used for holding cuspidors in carrying the same. The cuspidors are arranged one above the other and the side frames of the rack adjusted to clamp the same.

GREENHOUSE CONSTRUCTION.—F. VAN ASSCHE, Jersey City, N. J. It has heretofore been a fatal objection to iron-framed greenhouses that the expansion or contraction of the iron parts subjects the glass to destructive strains. By means of this invention Mr. Van Assche interposes a yielding or spring-like connection between the iron or metallic frame parts and the glass so that the expansive movements of the iron are not communicated irresistibly to the glass.

BARREL-HEAD FASTENING. — E. C. SHEARS, Lakota, No. Dak. This invention relates to improvements in barrel-head fastenings and its object is to provide a head and fastening that may be removed or inserted without breaking or otherwise damaging the barrel staves and further to provide, in connection with the fastening, a means for attaching a seal.

EXTENSION-LADDER. — W. H. SIBLEY, Wittenberg, Canada. The ladder comprises a plurality of connectible sections whereby the same may be extended for use as a fire-escape. The construction is simple, strong and conveniently arranged, and embodies a means for elevating or lowering portions of the ladder when partially or completely erected.

CEMENT ROOFING.—H. BROCK, St. Paul, Minn. Mr. Brock provides cement roofing panels of such construction that opposing panels will have overlapping, interlocking connection, so that longitudinal gutters will be formed therein to promote a ready discharge of water. The panels may be securely held to the roof lathing, each by a single nail, so that a row of panels may be tied in place by a simple system of wiring applied from the inside of the structure, all fastening devices being invisible from the outside.

PROCESS FOR TREATING FINE IRON ORES FOR BLAST FURNACES.—A. D. ELBERS, Hoboken, N. J. The invention provides a method of compacting fine iron ores which consists in mixing the ores with pulverized slag, burning such mixtures to a clinker and maintaining the mass in constant agitation during the burning to effect the segregation of the plastic clinker into lumps; the size of the clinker may be regulated to some extent and will probably average about walnut size.

PROCESS OF BURNING BRICK.—J. PECK, Haverstraw, N. Y. The object of this invention is to cheapen as well as to render more effective the work of burning brick in kilns; the process consists first in subjecting the kiln to the action of a fire fed with atomized oil and maintaining this fire until the kiln has been heated, and second, in stopping the oil fire and continuing the burning of the kiln by a fire fed with soft coal or other similar fuel.

TOBACCO-PIPE.—N. ALLISON, Hendersonville, N. C. The pipe is so constructed that it may be easily cleaned and the draft may be regulated. Conical pointed needle valves are provided at all angles for the purpose of providing this regulation. These valves are removable so that the parts may be readily cleaned. By causing the smoke to follow a tortuous passage the "biting" action which is so noticeable in ordinary straight-stem pipes is materially reduced.

STIFF-FINISHED WOVEN FABRIC.—A. MCLEAN, Passaic, N. J. In this invention Mr. McLean provides certain new and useful improvements in the manufacture of stiff-finished fabrics, such as buckram, whereby a very fine and beautiful appearance is given to the fabric and its body is rendered homogeneous throughout, forming a fabric of very high quality.

GATE.—W. D. OTT and F. L. PREBYL, Riverside, Iowa. This gate belongs to that class employed to guard a highway or passage from one enclosure on a farm to another. The invention embodies a novel and effective means for conveniently operating the gate so as to open or close it.

OIL-WELL PUMP.—S. W. MEALS, Waynesburg, Pa. This pump is arranged to dispense with sucker rods now employed and to permit a single operator to readily pull the valve plunger up for repairs to the valve cups and to avoid all danger of clogging up a well and consequent abandonment thereof on dropping the sucker rods, as so frequently happens in oil pumps as heretofore constructed.

PAD FOR TREATING SHOE-BOILS ON HORSES.—R. B. MUSGRAVE, New York, N. Y. Briefly stated the invention comprises a pad formed comparatively thick, so that when placed against the side of a horse's body, immediately behind the foreleg, the front portion will lie directly against the shoe-boil. This provides a protector for the shoe-boil when the horse lies down, the pad taking the weight of the horse and preventing pressure from being applied to the boil, also preventing the contact of the hoof and the shoe with the boil.

BURNER FOR LIQUID FUELS.—C. G. LUNDHOLM, San Bernardino, Cal. This burner is of the class in which the oils are atomized by a spray of steam or air previous to the combustion of the oil. The construction ensures the effective combustion of the oil and is especially adaptable for use in connection with heavy oils which have heretofore been difficult to consume.

FOLDING COT.—J. DAVIDOFF, Brooklyn, N. Y. Mr. Davidoff is the inventor of an improved folding cot, which is characterized by its simplicity and durability of construction. The cot is composed of comparatively few parts, is not liable to get out of order, and may be readily set up or folded into a very small space.

GAME APPARATUS.—D. SMITH, Griffin Corners, N. Y. The apparatus comprises a trap adapted to project a rolling target within the range of a toy gun which will throw a projectile toward the target, so that when proper skill has been developed the target may be struck by this projectile.

HAT.—A. L. DELION, 24 Boulevard des Capucines, Paris, France. The invention relates particularly to improvements in sweat-bands for hats, the object being to provide a simple means for so securing a sweat-band in place that it may be easily removed and a new one substituted when necessary. The purchaser may buy a number of sweat-bands with his hat and use them when desirable to keep the hat in a clean state.

CORSET ATTACHMENT AND STOCKING SUPPORTER.—LUCY B. INGHAM, Wilkesbarre, Pa. In this invention an inexpensive attachment for a corset is provided which when worn is well adapted for support of the abdomen and also affords a convenient and reliable means for supporting women's hose in a manner which will conduce greatly to the comfort of the wearer.

PROCESS FOR RENDERING ALUMINIUM CAPABLE OF BEING WELDED OR SOLDERED.—C. P. SORENSEN, Holger Dasokes Vej Nr. 75, Copenhagen, Denmark. This process for rendering aluminium capable of being soldered consists in first heating the metal to about 300 degs. centigrade and then subjecting it to the action of concentrated soda-lye, and finally rinsing with cold water.

PROCESS OF MANUFACTURING SHEET-METAL PIPE ELBOWS.—E. H. SMITH, Mount Vernon, Ohio. The process consists in shaping up from a plain blank an intermediate blank having opposite longitudinally-extending and parallel semicylindrical portions provided with transverse crimps or corrugations extending to their edges and an intermediate elevated portion. This blank is bent into approximately a cylindrical form and then into elbow form whereby the preliminary crimps are flattened radially upon the surface of the elbow.

MESSAGE-BOX.—A. F. SHRIVER Arbuckle, Cal. The invention provides a message-box that may be secured to the outer side of an office door or other support, whereby messages may be written on paper contained in the box and moved to a place of concealment in the box, to which access may be had by the owner or person having the key.

BOTTLE-CLOSURE.—G. J. ADAMS, Brooklyn, N. Y. This invention provides improvements in stoppers for packages containing toilet powder or the like and belongs to that class having two parts provided with outlet openings and arranged to rotate one part relatively to the other, so as to cause a register of the openings or to close the same. This invention aims to provide a closure of this kind in which the two perforated parts will be automatically held close together at all times, thus preventing an accumulation of powder between the parts.

METHOD OF PRODUCING MOUTHPIECES ON CIGARETTES.—L. H. SONDHEIM, New York, N. Y. The process relates to the production of mouthpieces on open-ended cigarettes, cigars, or cheroots, by coating or impregnating the wrapper at one end with a fluid substance which will harden on the wrapper and become impervious. Mr. Sondheim provides an improved method of affecting the application of the coating or impregnating the material to the wrapper without permitting this material to enter the cigarette or to come in contact with the tobacco exposed at the end.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

September 16, 1902,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Acids, separating sulfonic, L. O. Helmers. 709,321
Aerated liquids, apparatus for dispensing, W. Hucks, Jr. 709,407
Air and vapor motor, combination, A. McCahon 709,030
Alloy, D. P. James 709,268
Ammunition hoist for ordnance, Dawson & Horne 709,436
Animal exterminator, L. N. Cornett 709,207
Animal tendons, treating, E. Nelson 709,352
Armature winding machine, drum, H. Schulz 709,179
Axle, vehicle, F. E. Fisher 709,213
Bag making machine, J. F. Ames 709,451
Ball. See Playing ball.
Balls, machine for reducing and finishing hollow, A. Johnston 709,409
Basin clamp, J. O. Noble 709,170
Battery jar, storage, P. Kennedy 709,157
Beams, channel beams, etc., machine for shaping metal I, W. A. Dunn 709,081
Beams, channel beams, etc., shaping metal I, W. A. Dunn 709,080
Bearing, ball, H. Cogswell 709,206
Bearing, roller, C. A. Carman 709,136
Bearing, roller, A. E. Henderson..709,322, 709,441
Bed and sofa or chair, convertible, L. Kragen 709,333
Bell and burglar alarm, combination door, F. E. Abbott 709,252
Belts, etc., device for cutting off pieces of, E. H. Jahnz 709,408
Bicycle frame, motor, Wagner & Bird 709,380
Bicycle pedal, J. A. Decuir 709,306
Bicycle pump, automatic, T. A. Diebold 709,397
Blacking box holder, G. A. Joy 709,226
Boat, life, R. D. Mayo 709,417
Body brace, P. B. Sheldon 709,055
Boiler furnace, steam, O. D. Orvis 709,173
Boiler tube expander, F. Palfrey 709,276
Book, manifolding note, W. F. English 709,259
Book, manifolding sales or copying, P. Hano 709,320
Boot stitching machine, Randall & Davis. 709,041
Boring bar, Neylon & Gouldsbarry 709,275
Bottle, J. O'Connor 709,419
Bottle closure, W. J. Bycraft 709,201
Bottle closure, G. J. Adams 709,292
Bottle filling and corking machine, W. B. Langan 709,413
Bottle, non-refillable, H. F. Bailey 708,981
Bottle, non-refillable, R. McCord 709,031
Bottle, non-refillable, W. G. Lawrence 709,099
Bottle stopper, I. Koscherak..709,161, 709,162
Bottle stopper, C. W. Meinecke 709,418
Bottle stopper and sprinkler, H. O. Brawner 709,391
Bowling alley, H. B. Lahr 709,163
Box sanding machine, Palmer & Denmead. 709,033
Boxes, etc., securing device for, W. G. Young 709,386
Bracelets, etc., and manufacturing same, band for, T. S. Bennett 709,195
Brick machine dies, lubricant apparatus for, H. K. King 709,097
Bridge suspension cables, system for erecting and adjusting, W. J. Glover 709,316
Bucket ear, F. T. Brosi 709,299
Buggy storm curtain, B. S. D. S. Martin. 709,026
Building construction, C. E. Cottrell 709,257
Burial casket rough box, P. D. Skahen 709,423
Burner. See Gas burner.
Burner attachment, Roy & Marshall 709,278
Burner tip cleaner, S. Carlson 709,077
Cabinet, machine bearing, T. Kundtz 709,098
Calculating machine, F. C. Rinsche 709,244
Calculating machine, A. C. Schuman, 709,362, 709,365
Calculating machine dating attachment, A. C. Schuman 709,364
Calendar, W. C. Norman 709,353
Can, J. H. Kuechenmiester 709,017
Candy cooler, G. S. Collum 709,139
Cane, J. S. Judy 709,095
Car, box, J. R. Kilbourne 709,330
Car, convertible railway, Brill & Bucknam 709,073
Car, convertible railway, E. S. Bucknam, 709,075, 709,076
Car coupling, W. S. Lennon 709,338
Car coupling draft rigging, railway, J. A. Hinson 709,404
Car door, S. J. Johnson..709,269, 709,270
Car door, grain, G. Stirrett 709,247
Car door, grain, A. L. Hook 709,325
Car draft spring rigging, railway, E. W. Samen 709,361
Car, freight, H. S. Godfrey 709,009
Car gates, means for operating railway, E. E. Gold 709,261
Car guard device, coupled, J. Eisenmann 709,145
Car, hand, J. R. Roach 709,175
Car, platform, Vogel & Weber 709,249
Car record device, J. R. Cavanagh et al. 709,394
Car, steel box, J. R. Kilbourne 709,329
Car street indicator, railway, C. E. Morgan. 709,236
Car wheel, F. E. Crandal 709,208
Car wheels, manufacture of, J. W. Morgan, Jr. 709,446
Carpet cleaning device, E. C. Stentz 709,122
Carpet sweeper roller bearing, F. C. Mason. 709,444
Catamenial bandage, James & Kippen 709,223
Cattle guard, M. L. Miller 709,105
Chain, driving, Grandjean & Bouvier 709,149
Check lock, automatic, H. W. Denison 709,141
Chuck drill, A. I. Jacobs 709,014
Chuck, drill, A. J. Studnicka 709,061
Churn, centrifugal, W. B. Chalfant 703,137
Chute, coal, W. H. Taylor 709,373
Cigar cutter, J. C. F. Dick 709,209
Cigar marking machine, F. H. Richards 709,360
Cigarette mouthpiece, producing, L. H. Sondheim 709,369
Circuit breaker, F. A. Merrick 709,232
Clay, etc., apparatus for molding the exterior of articles in, M. J. Adams 709,131
Clock, electric, C. J. Moberg 709,234
Clothes pounder, K. D. McLay 709,109
Clutch, friction, G. M. Bennett 709,194
Collar, E. F. Brown 709,074
Collar, split, E. H. Sexton 709,366
Combination draft furnace, O. D. Orvis 709,174
Combination lock, W. J. Carroll 709,078
Combustion process, J. Tatham 709,372
Commode, sanitary, L. R. Damon 709,305
Compass, pocket, C. C. Rueger 709,046
Computing machine, A. C. Schuman 709,363
Conduit sections, machine for cutting recesses in, R. W. Lyle 709,025
Conveyor bucket, endless, P. B. Clarke 709,203
Conveyor safety stop, P. B. Clarke 709,202
Cooling and condensing apparatus, W. A. Maybach 709,416
Corset, S. G. McClain 709,238
Cotton chopper, L. P. Fay 709,147
Cotton fiber condenser, J. M. Gardner 709,090
Coupling. See Car coupling.
Crate, banana shipping, M. Lombardo 709,166
Cream separator, C. W. Parks 709,035
Curd knife and whey strainer, combined, L. T. Hankins 709,319
Cuspidor, A. Lindsay 709,165
Delivery mechanism, W. Scott 709,180
Dental bridgework, J. L. Kelly 709,410
Deodorizer, milk or cream, H. R. Howe 709,093
Deodorizing milk or cream, H. R. Howe 709,094
Derailer, G. L. Mansfield 709,101
Despatch apparatus, tubular, W. A. H. Bogardus et al. 709,434
Detonating device, J. H. Bevington 709,197
Diamond cutting tool, E. Mahy 709,229
Door catch, G. G. Smith 709,057
Door hanger track, P. A. Myers 709,029
Door hanger track, H. L. Ferris 709,314
Dough cutter, G. F. Zinn 709,290
Draft equalizer, J. B. Hayden 709,092
Drafting device, W. F. Hochspeier 709,219
Drain tile protector, J. W. Cook, Sr. 709,395
Dredging bucket, C. Pay 709,420
Drilling machine, W. E. Butler 708,995
Dye and making same, blue, Weinberg & Klingemann 709,186
Dye and making same, blue sulfur, R. Herz. 709,151
Dye and making same, green, J. Koetschet. 709,160
Dye and making same, yellow acridin, A. Weinberg 709,187
Electric and gas lighting system, combined, F. C. Pickett 709,039
Electric circuit lead fuse, F. H. Krebs 709,334
Electric condenser and making same, H. P. Clausen 709,205
Electric motor controller, E. W. Stull 709,182
Electrical conductors, manufacturing, L. W. Downes 709,001
Embossing machine, F. K. Russell 709,422
End board securing attachment, wagon, W. L. Sterling 709,123
Engine hydrocarbon feeder, explosive, F. B. Warring 709,428
Engine support, Menns & Van Horn 709,445
Engine vaporizing device, explosive, B. C. Vanduzen 709,126
Evaporating apparatus, vacuum, C. Ordway. 709,172
Evaporator, W. Bender 709,297
Explosive engine, four cycle, H. C. Strang. 709,060
Extensible pan, J. T. Halls 709,150
Fabrics, machine for producing water marks on, E. Smith 709,368
Faucet, R. W. Booth 709,389
Faucet or tap, L. Wolf 709,189
Feed box for live stock, G. M. Fillmore 709,438
Feeding, printing, and cutting strips of material, machine for, S. Kops 709,271
Fence, G. Gentslinger 709,215
Fence fabric, woven wire, E. L. Warner 709,065
Fence post, W. R. Johnson 709,224
Fence post, J. Buchtel 709,300
Ferrule for fork handles, G. A. McKeel 709,108
Fertilizers, making, B. Terne 709,185
Firearm, magazine, C. A. Young 709,385
Firearms and artillery, protection against shot from hand, A. Leven 709,100
Fire escape, M. Wachter 709,127
Fire escape, W. H. Taylor 709,374
Folding table, W. O. Nussbaumer 709,171
Folio holder, D. E. Hunter 709,221
Foot power device, Clark & Davis 709,435
Forking, elevating, and conveying machine, A. P. Tatterson 709,248
Furnace, D. S. McDonald 709,107
Furnace gases, desulfurizing, E. Pollacsek 709,358
Game apparatus, W. Gibb 709,007
Game apparatus, C. E. Edgerly 709,144
Game board, J. E. Johnston 709,155
Garbage, treating, S. E. Wilson 709,384
Garbage treating apparatus, S. E. Wilson. 709,450
Garment, combination nether, M. E. Buckley 709,200
Gas burner, J. W. Piper 709,356
Gas generator, acetylene, C. W. Metcalf 709,344
Gas generator, chlorin, T. Edwards 709,004
Gate, J. J. Hynding 709,153
Gear teeth, machine for cutting helicoidal, L. F. A. Monneret 709,235
Gear wheel, two speed, W. D. Wansbrough 709,381
Gearing, H. L. Wright 709,287
Generator. See Gas generator.
Glass grinding and polishing machine, W. Lahodny 709,020
Glass grinding machine, W. Lahodny 709,019
Glass silvering trough, C. Laval 709,336
Gold ores, treating telluride, W. Pethybridge 709,038
Gold ores, treatment of telluride, W. Pethybridge 709,037
Governor, engine, H. C. Strang 709,059
Grain elevating machine, M. W. Heyenga. 709,012
Graphoscope, L. Lewis 709,415
Grate, J. T. Vaughn 709,377
Grindstone tool guide, S. C. Schofield 709,177
Grindstone tool holder and guide, S. C. Schofield 709,178
Gun, machine, E. M. Capps 709,301
Hair pin, W. S. Bechtold 709,255
Hammer, valveless, D. S. Waugh 709,067
Handwriting developer, F. C. Rockwell 709,114
Harrow, E. R. Butts 709,256
Harvester, corn, J. Strand 709,424
Hoisting device, P. Jablonowsky 709,222
Horse overshoe, J. Bartlett 709,983
Horse shoe, E. D. Bangs 708,982
Hose coupling, electric, M. C. Goodwin 709,216
Hub, vehicle, E. B. Phillips 709,241
Hub, wheel, H. N. Thayer 709,375
Hydraulic press swinging table, M. Wilkes. 709,285
Hydrocarbon burner, E. Betz 709,387
Hydrocarbon burner, W. H. Stewart 709,443
Ice cream dipper, E. C. Baughman 708,987
Incandescent light burner, petroleum, M. Bramson 709,198
Inflatable wheel, puncture proof, A. Honrath 709,324
Ink well, S. G. Baldwin 709,133
Iron bending machine, angle, W. Vollmer. 709,282
Iron bending machine, flat, W. Vollmer 709,283
Jar cover, R. W. Booth 709,390
Knife, cutter, or dieing-out instrument, J. M. Gimson et al. 709,008
Knitting machine, M. Saldin 709,047
Knitting machine, H. Janssen 709,154
Label, G. E. Howard 709,326
Ladder, C. B. Smith 709,118
Ladder and truck therefor, extension, E. A. Herndon 709,402
Lamp chimney protector, W. C. Burress 709,393
Lamp holders, match safe attachment for miners, J. A. Brown 709,452
Last, A. B. Taylor 709,425
Liquid distributing or dosing tank and mechanism, S. W. Miller 709,233
Liquid receptacle, W. Elkan 709,211
Liquids with gases or gases with liquids, apparatus for treating, Vosmaer & Lebret 709,379
Liquors from kegs, treating air for forcing malt, C. A. Bartliff 708,984
Loader and digger, portable mechanical, G. C. Brown 709,199
Lock, C. Kunzelmann 709,018
Lock, G. G. Smith 709,056
Lock, H. W. Eicher 709,309
Locks, gage for measuring keys for pin tumbler, E. S. Phelps 709,240
Locking device, J. W. Gonce 709,010
Locomotive, J. H. Williams 709,429
Locomotive boiler, J. H. Williams 709,430
Locomotive sand delivering pipe, I. T. Lewis 709,414
Loom for weaving pile fabrics, A. F. McCollum 709,447
Loom shedding mechanism, G. W. Stafford 709,453 to 709,455
Loom shuttle binder, F. A. Guillette et al 709,317
Loom, weft replenishing, H. I. Harriman. 709,440
Lubricator for elevator ropes, etc., M. H. Halloran 709,318
Magnesium, making peroxid of, F. Elias 709,086
Mantle trimming mechanism, J. T. Robin. 709,044
Marking machine, F. J. Hagen 709,011
Massaging device, C. E. Mason 709,103
Match boxing machine, W. F. Hutchinson 709,267
Match machine, W. F. Hutchinson 709,266
Match machine dipping roll, J. P. Wright. 709,190
Measuring machine for rolled goods, H. R. Meade 709,231
Milk albumen, producing soluble, H. V. Dunham 709,003
Mill. See roller mill.
Miter box, Abbott & Randel 709,251
Mitten, R. B. McMasters 709,350
Monorailway, E. A. Green 709,263
Music sheet for automatic musical instruments, perforated, C. H. Shaw 709,054
Music sheets, end fastener for perforated, H. E. Beach 709,296
Musical instrument, electrical self playing, H. E. Beach 709,295
Nickel and copper nickel ores, treatment of, C. Perron 709,277
Nickel, melting, H. L. Haas 709,218
Numbering machine, Waterman & Berthold 709,128
Nut lock, G. H. Roberts, Sr. 709,043
Nut lock, G. L. Pitman 709,357
Nut lock, S. C. Baughn, Jr. 709,433
Oil burner, E. Stewart 709,370
Oleaginous compound, C. Adams 709,291
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Rotary steam engine, J. W. K. Hodge 709,323
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Stocking supporter, E. H. Waterman 709,066
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Swing, lawn or house, O. R. Olson 709,110
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Water heater, wall, J. H. Mackley 709,340
Water motor, N. Schmidt 709,279
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Weaner, calf, D. Daggett 709,140
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"Paride's Miraculous," for a medical compound, P. Grasso 556

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

NEW BOOKS, ETC.

WOERTERBUCH DER ELEKTROTECHNIK. Deutsch-Franzoesisch-Englisch. Herausgegeben von Paul Blaschke. Mit einem Vorwort von Dr. F. Niethammer. I Teil. Leipzig: Verlag von S. Hirzel. 1901. Octavo. Pp. 146.

DICTIONNAIRE ELECTROTECHNIQUE. Français-Allemand-Anglais. Par Paul Blaschke. Leipzig: Libraire S. Hirzel. 1902. Octavo. Pp. 144.

It is a singular fact that the best technical dictionaries are strangely defective in electrical definitions. For that reason the two volumes issued by Hirzel should be particularly welcome. It is impossible to state how full and how accurate these volumes are without having used them for some considerable period; but a fairly careful examination of their pages, and a comparison with the best technical dictionaries, convince us that the books are a most valuable addition to electro-technical literature. The publishers should be congratulated upon the handsome appearance of these books. The main headings are printed in large, bold type, so that the labor of looking up a term is very considerably facilitated.

REFRIGERATION, COLD STORAGE AND ICE-MAKING. A Practical Treatise on the Art and Science of Refrigeration. By A. J. Wallis-Tayler, C.E. London: Crosby Lockwood & Son. New York: D. Van Nostrand Company. 1902. Pp. xxi, 590. 8vo. Price $4.50.

In 1895 the author published a small book entitled "Refrigeration and Ice-Making Machinery." Since that time the literature of the subject has so vastly increased, and methods have so far improved, that a new edition seemed necessary. The present volume is a very much enlarged "Refrigeration and Ice-Making Machinery," presenting, as it does, every known modern process of refrigeration.

STRAY LEAVES FROM A BORDER GARDEN. By Mary Pamela Milne Horne. London and New York: John Lane: The Bodley Head. 1901. Pp. 340; 8 illustrations.

To anyone who is fond of flowers, birds, and nature in general, this book will be found most interesting reading. It consists of a diary kept throughout a year by a lady passionately interested in flowers and nature and living in an ancient country house on the famous Scot-

(Continued on page 211)

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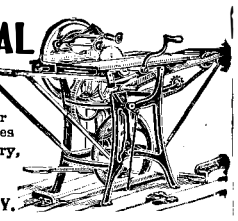

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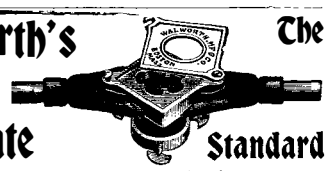
Walworth's Solid Die Plate  **The Standard**

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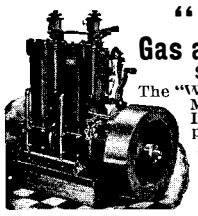

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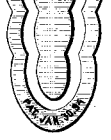

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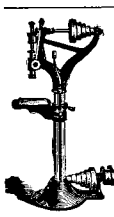

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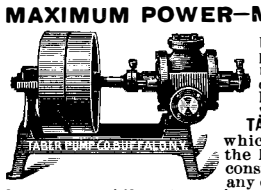

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tish border. The book contains a fund of information as to the history, sentimental meaning and derivation of names of the various flowers. Interspersed with the prose matter are numerous rhymes and appropriate bits of poetry. One of the best features of the work is a glossary of flowers and birds which gives the names of each in the various languages ancient and modern. Another chapter on the "Vernacular of the Border" gives the English and foreign equivalents of many Scotch expressions.

ALTERNATING CURRENT MACHINES. By Samuel Sheldon, A.M., Ph.D., and Hobart Mason, B.S., E.E. New York: D. Van Nostrand Company. London: Crosby Lockwood & Son. 1902. 16mo. Pp. iv, 259. Price $2.50.

The present volume is a companion to "Direct-Current Machines." The plan of the book comprises four chapters on first principles; four chapters on construction; principles of operation and behavior of the various types of alternating machines; and two chapters on power transmission and tests. The book, disclosing as it does the latest American types of machines, is modern in every way.

WEATHER FOR THE CORONATION DAY, June 26, and Four Days Before and After, Fully Forecasted, and the Method of Prediction Fully Explained. By Hugh Clements. London: Simpkin Marshall, Hamilton, Kent & Co. Pp. 16. Price 13 cents.

We have waited rather late in reviewing this little pamphlet for the purpose of verifying the author's prophecies. Like other prophets who have attempted to foretell the state of the weather months in advance of a given date, he fails utterly. His barometric pressures never reached 30, whereas the actual recorded barometric pressures between June 23 and June 28 were all above 30. We have no figures for June 22 or for June 29. For June 30 the pressure was 30.04. The state of the weather has also been inaccurately foretold, although on the whole more success has been attained than in the prophesying of barometric pressures. The weather prophecies for June 24, 26, 27 and 30, for example, are absolutely wrong. For June 22 and 29 we have no official information.

METHODS OF GAS ANALYSIS. By Dr. Walther Hempel. Translated by L. M. Dennis. New York: The Macmillan Company. 1902. 12mo. Pp. xix, 490. Price $2.25.

In this new edition of Hempel's analysis some very important changes may be noted. Additions have been made which comprise several new methods of collecting and keeping gas samples.

THE TRUST: ITS BOOK. By Charles R. Flint, James J. Hill, James H. Bridge, S. C. T. Dodd and Francis B. Thurber. Edited by James H. Bridge. New York: Doubleday, Page & Co. 1902. 16mo. Pp. xxxviii, 255. Price $1.25.

At a time when our country is passing through a great industrial upheaval, when at frequent intervals great combinations are formed, the thinking man naturally ponders over the sociological conditions which are likely to ensue. That there are undoubted benefits to be derived from the formation of huge trusts cannot be denied; that there are also undoubted evils is still less to be denied. The present book, which is the compilation of the most prominent American business men—men who are intimately associated with the upbuilding of the trust—is well worth reading. It presents on the whole, in a fairly impartial way, the economic conditions resulting from the formation of great trusts.

A UNIVERSITY TEXT-BOOK OF BOTANY. By Douglas Houghton Campbell, Ph.D. New York: The Macmillan Company. London: Macmillan & Co. 1902. 8vo. Pp. xv, 579. Price $4.

This book is not intended as a laboratory manual, but is designed primarily as a work of reference. The author assures us that it is prepared for the use of students of American colleges and universities and that it has therefore seemed proper to use illustrations of the native flora. A short bibliography is appended to the book.

NEW YORK STATE LIBRARY. Bulletin 69, December, 1901. Comparative Summary and Index of Legislation in 1901. Albany: University of the State of New York. 1902. Pp. 1229. Price 25c.

We have received from the International Cable Directory Company, No. 17 State Street, a copy of the International Cable Directory of the World, issued in conjunction with the Western Union Telegraphic Code System. This book to users of the wires, both for domestic and cabling purposes, is to the business public exactly what the telephone book is to users of the telephone, as it furnishes the cable addresses of prominent corporations, firms and individuals in all parts of the globe, and is therefore invaluable for reference. The book was adopted by the State Department mainly for the promotion of commercial relations with the United States by residents of other countries. The great success of the work has induced the publishers to print the business headings in German, French and Spanish, in addition to English.

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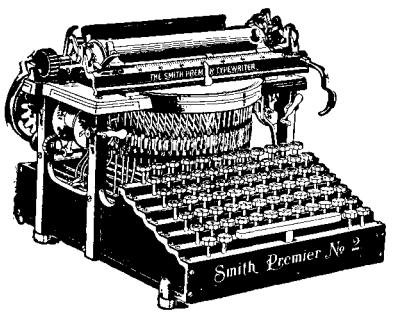

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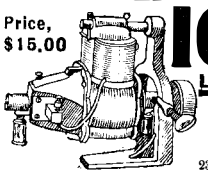

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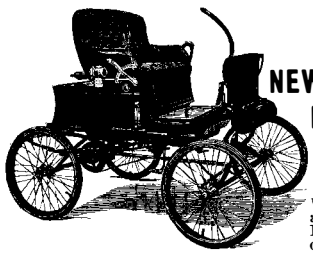

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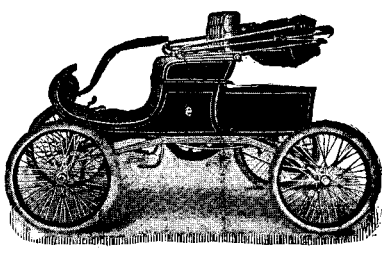

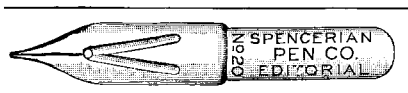

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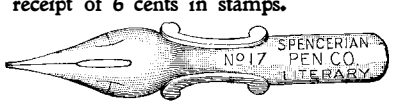

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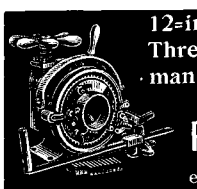

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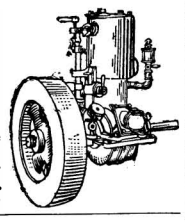

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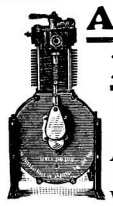

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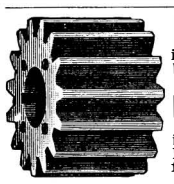

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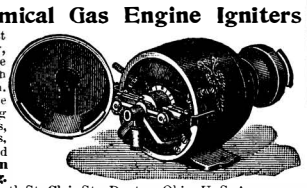

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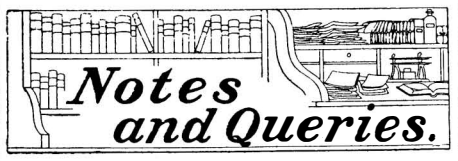

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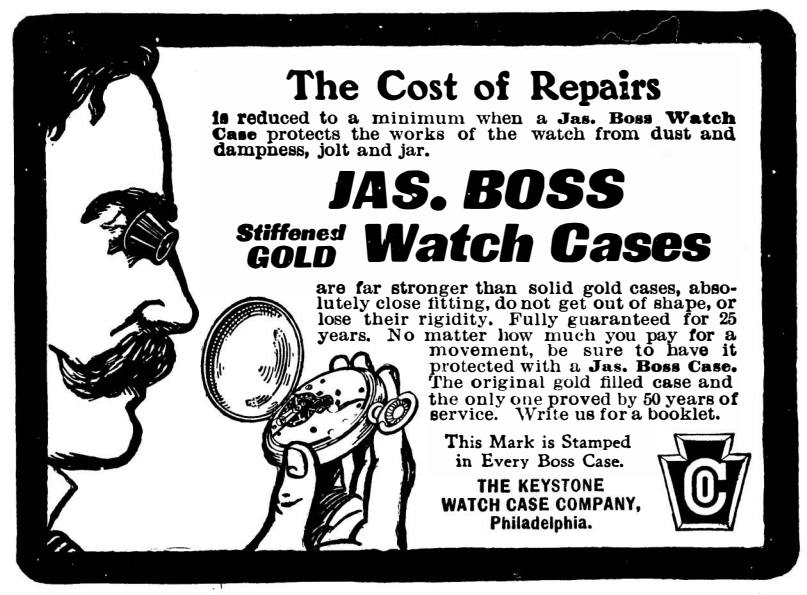
(8693) F. H. asks: 1. I have a yoke and cores for an electromagnet. Yoke, 8 by 1½ by 1¾ inches; cores, 6 by 1 inch. I have at my disposal six large bichromates. What number of B. W. G. should I use, and how many pounds of the same to obtain the best effects in connection with my battery? A. Use No. 14 magnet wire, and wind to a depth of one inch on the spools. You will find in the new edition of Hopkins' Experimental Science, price $5, full directions for such a magnet. 2. Also if such a magnet could be used for diamagnetic experiments? A. Yes; with pole pieces properly shaped to bring the flux to the point where the diamagetic substance is suspended. These, too, are illustrated in Hopkins. 3. Please give me the best proportions of water, bichromate of potash and sulphuric acid for bichromate cells (water and acid in cubic centimeters and bichromate in grammes). I have several recipes, but they all differ with regard to proportions of bichromate and acid. A. There are many formulas for the bichromate solution. We cannot say which one is the *best*. Practice now is to use chromic acid directly in place of bichromate of potash. Indeed, bichromate of soda is to be preferred to the potash salt, since it is more easily dissolved and the solution does not throw down crystals as bichromate of potash does. The idea is to have a saturated solution of the salt and add sulphuric acid to a proportion of about one in ten to one in twelve. If the acid is more than one in ten it will act too strongly on the zincs and the cell will overheat, the liquid "boiling" as it is called.

(8694) W. M. H. asks: 1. May the direction in which the armature of a dynamo or motor revolves be governed at the will of the operator by change of current or other means. A. A dynamo may be run in either direction by placing the brushes so that they lead in the proper direction. A motor is reversed by changing the direction of the current in either the field or the armature, but not in both. 2. What means is employed to change the direction in which a trolley car runs? A. By throwing the reversing switch to change the current as above.

(8695) G. H. D. asks: 1. Does kilowatt mean 1,000 watts? A. A kilowatt is one thousand watts. 2. How many electrical horse power does 90 kilowatts equal? A. Ninety kilowatts are 90,000 watts; 746 watts are one electrical horse power. Divide 90,000 by 746 and the quotient is the number of horse power there are in 90 kw. 3. What does the term *cycle* mean when electrically speaking? A. Cycle is the series of values of the E. M. F. in an alternating current. 4. What is the full meaning of phase? Of mono-phase? Of multi-phase? Of two-phase? Of poly-phase? A. Phase is the fractional part of a period which has elapsed since a vibrating body last passed through the extreme point of its path in the positive direction. Mono means single, multi means many, and poly means many, though both multi and poly are used for any number of phases more than one. The terms in common use are single phase, di-phase or two-phase, and three-phase. The alternating current starts from zero as its middle point, rises to its highest value, falls as far below zero as it rose above and returns to zero. This it does in one cycle, and this is repeated many times a second, and is single phase. Now if a second E. M. F. starts after the first is one-quarter way along and follows the same variations, the two existing in the same circuit, the current is diphase. If there are three variations in the current, one-third of a cycle apart, the current is three-phase. 5. What is meant by frequency? A. Frequency is the number of cycles per second. 6. What voltage will kill a person? A. A direct current of 500 volts pressure, we suppose, has proved fatal to a human being. Less than this would be required if the current were alternating. 7. I know of a dynamo, of 1,100 volts, 81 amperes, and 90 kilowatts. How can I calculate the number of 16 c. p. lamps it will burn? A. A dynamo will light from eight to twelve 16 c. p. lamps per horse power, or you may allow 55 watts per lamp. 8. I know of a telephone (on a metallic cir-

(Continued on page 213)



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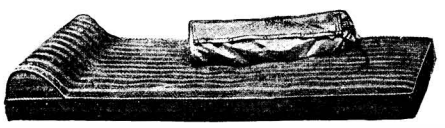

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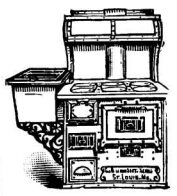

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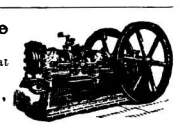

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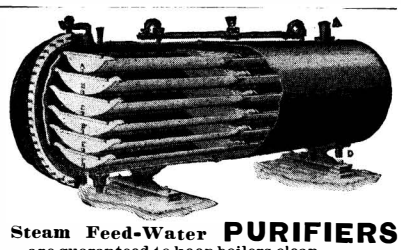

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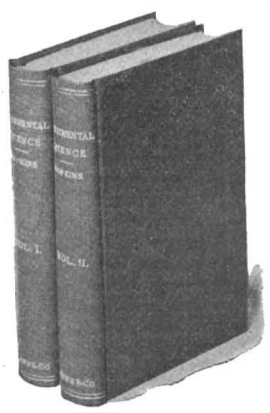

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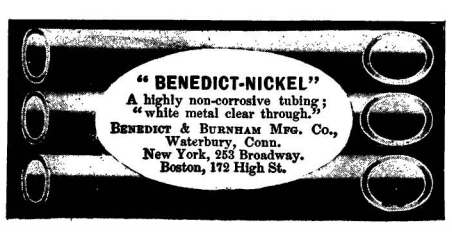
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(8696) C. E. T. asks: 1. I am thinking of making a small direct-current dynamo, and would like to know the formula and meaning of the symbols for wrapping and determining the size of wire to be used in order to get a given voltage and current. A. Perhaps the simplest book for calculating the parts of a dynamo is given in "Practical Electricity," price $2 by mail. There is, however, no easy road to designing dynamos and motors. The best way for the amateur to go about the building of a dynamo is to select the size of machine he requires and buy plans for it all worked out. Many such designs have been published in the SCIENTIFIC AMERICAN and other periodicals and in books. We have frequent occasion to recommend such to our correspondents. They can be had very cheap. 2. I would also like to know the name of a good reliable varnish or lacquer for using on articles of steel or iron so they will stand a good deal of handling and to be kept in a damp place so as they will not rust. A. A good lacquer for rough ironwork is made with 6 parts asphaltum dissolved in turpentine, 1 part shellac dissolved in wood alcohol; mix and thin with turpentine or wood alcohol. For bright steel or iron, a shellac and mastic varnish is much used; 10 parts shellac, 1 part mastic dissolved in wood alcohol. Color with any of the aniline dyes. Blue is much in use.

(8697) G. P. M. asks: What are the true primary colors? A. Primary colors are the colors into which white light is separated by the dispersion of a prism. Those named by Newton are red, orange, yellow, green, blue, indigo, and violet. Artists reduce these to three—red, yellow, and blue. Scientists generally consider red, green, and blue to represent the primary color sensations, and in one theory there are supposed to be three sets of nerves in the retina which can respond to these three colors. The idea of three primary colors is that from the combination of these three all hues may be produced which are to be found in white light.

(8698) E. A. writes: Please give me an explanation of the following phenomenon: During a rainstorm a click or brief ring of the telephone bell is frequently audible. It is evidently due to the lightning being coincident with it. But how does the lightning produce the effect? Also, why may a spark often be seen shooting from five to twenty feet from the 'phone? Is it harmful? Please answer the following questions: What chemicals are used in the makeup of a Mesco dry battery cell? Please explain the chemical action? Is the cell affected by heat or cold? Are the chemicals injurious to the body if handled? A. The clicking of electrical apparatus during thunderstorms is due to the action of the lightning flashes upon the lines. When they are struck there will frequently be a flash from the wires, even though the lightning arresters do their work properly. The lightning produces the effect because it is an electric discharge, the same as the usual current, only much more intense. It is not entirely safe to handle electrical apparatus during a thunderstorm, when the wires are strung upon poles, though the lightning arresters usually protect the instruments. We have not the formula for the composition of the Mesco dry cell. It probably contains the same materials as the Leclanche cell, since all dry cells are modifications of this form of cell. These cells are very little affected by heat and cold, cannot be frozen by winter temperature even on mountain tops, and the chemicals are not poisonous. The general chemical action is that the ammonic chloride acts upon the zinc chloride. The hydrogen goes to the manganese dioxide and forms water with its oxygen. This is only general, since other substances may be used and other and more complicated reactions take place.

(8699) C. R. McM. writes: I desire to maintain a heat of about 105 degs. to 110 degs. in a box containing about 8 cubic feet of air. Can I do it by sending a current from a small battery through wires? How many cells and what kind? How much wire and what kind? A. We cannot advise the heating of air by electricity if expense is an object. It will cost many times as much as an oil lamp, and be as difficult of regulation as that. It can be done, however, by a coil of No. 14 or No. 16 iron wire with three or four cells of battery. The bichromate cell will give the heat quickest. The Edison-Lalande cell also may be used. It will work slower and last longer. A bichromate cell will need to be renewed every day. The length of wire should be perhaps fifty feet. We cannot give definite figures, since there are so many circumstances to affect the result. If you get too much heat reduce the battery, if too little add more cells.

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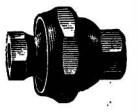

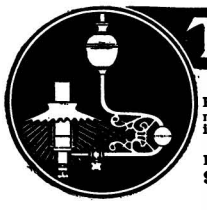

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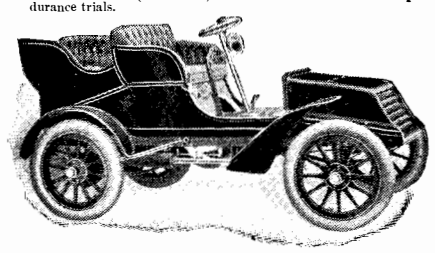

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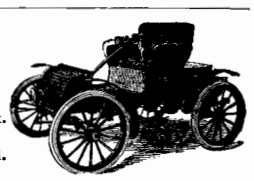

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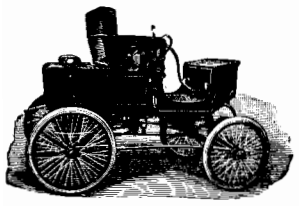

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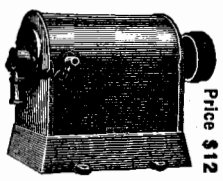

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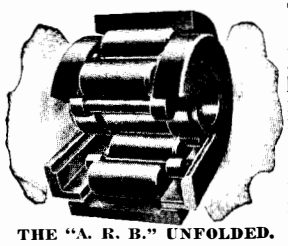

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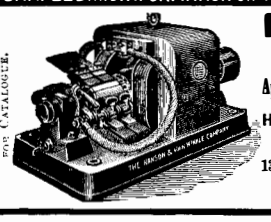

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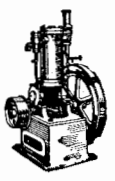

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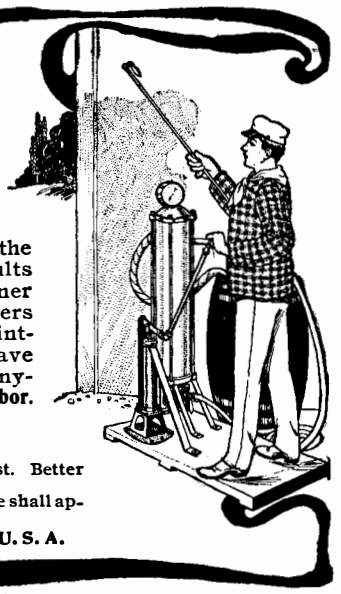

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